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CONTENTS.

ILLUSTRATED ARTICLES: PAGE.
Bazin Rotative Battery 72
The Sperry Electric Light System 73
The Shipman Automatic Steam Engine for Domestic Electric Lighting 75

EDITORIAL PARAGRAPHS 71

MISCELLANEOUS:
Chat of an Old-Timer 72
Dr. Norvin Green Explains .. 72
A Criticism of the Trowbridge Report on the Triple Thermic Motor 74
The Ide Automatic Engine .. 74
The Muthel Incandescent Lamp 74
A Mechanical Engineer on the "Triple Thermic" 74

MISCELLANEOUS: PAGE.
Another Decision as to Delivery of Telegrams 74
Electric Railway at Baltimore 75
The Early Days of Telegraphy 75
National Electric Light Association 76
Reunion of Old-Time Telegraphers 78

DEPARTMENTS:
New England Notes 79
Western Notes 79
The Telegraph 79
The Telephone 79
The Electric Light 79
Miscellaneous Notes 79
Stock Quotations 79
Business Notices 79
Our Illustrated Record of Electrical Patents 80

New Advertisements.

PAGE.
R. I. Braiding Machine Co.—Wire-Covering Machines i
Railway Telegraph Supply Co.—Telegraph Instruments and Supplies, etc ii
New England Glass Works—Electric Light Globes ii
Rhode Island Telephone and Electric Co.—Telephone and Electrical Apparatus iii
Narragansett Machine Co.—Foot-Lathes for Electricians iii
Shultz Belting Co.—Leather Belting iii
A. L. Ide & Son—The Ide Automatic Engine iv
Currier & Jones—Agents Wanted for Marshall's Grant vii
Wanted—Position as Electrical Machinist vii
Providence Electric Supply Co.—Electrical Goods vii
The Ideal Pen Co.—Waterman's "Ideal" Fountain Pen vii
The Carhart Patent Aërial Cable Clip vii
Currier & Jones—Engraving of General Grant vii
Geo. J. Fritz—Electric Light Engines viii
T. C. Frenyear & Co.—Luminous Electric Goods ix
The Bishop Gutta-Percha Co.—Submarine, Subterranean and Aërial Cables ix
American Carbon Co.—Carbons for Electric Lighting x

RE-ARRANGED ADVERTISEMENTS.
Standard Underground Cable Co iv
Gill & Segerdahl Electric Co.—Electrical Apparatus and Supplies. viii
Consolidated Electric Light Co x
The Excelsior Electric Co.—Dynamo Machines and Lamps xi
Schuyler Electric Light Co.—Dynamo Machines and Lamps xi

Vol. VI. NEW YORK, AUGUST 22, 1885. No. 8.

THE proposition made by Prince Bismarck to establish a uniform tariff of 4 or 5 cents a word for all Europe on messages passing from country to country, has been killed in the International Telegraph Conference now in session in Berlin. The Tariff Committee appointed to consider the scheme rejected it by a vote of 11 to 7, which would indicate that the idea was not very popular.

THE "Novelties" which is to open in Philadelphia on the 15th of next month is growing apace, and promises the most flattering success. The sound judgment and enterprise of the managers, the absorbing interest which is inseparable from such an exhibition, and the fact that it is situated within two hours' ride of five millions of people, all contribute to assure the same grand result.

SOME of the newspapers are greatly interested in the current story of an "engagement" just made by means of the Atlantic cable. It is to be hoped that international codification of laws will never allow a marriage ceremony to be performed with the help of that submarine intermediary. Engagements by wire and "wired love" are well enough, but nobody wishes to see a new form of the blasphemous farce known as "marriage by telegraph."

THREE judgments of $250 each have been rendered in Cincinnati against the "Union Telegraph Company," a well-known swindling concern that has fleeced the innocents of several cities. The company professes to be able to teach telegraphy and to secure positions for its pupils; but, as we have had occasion to show more than once, its operations are fraudulent from beginning to end. It is time the rascals who form the "company" were punished.

Now that the American District men, the Telephone men, the Old-Timers, the Military Telegraphers, the Telegraphers' Mutual Benefit Association and the Electric Light men have fallen into line on the matter of annual gatherings—conventions and reunions—we should hear from the Underground men, and we hope to see them soon in National Convention in this city. After them, we should hear from the Electric Railway men, and then—but these rapidly accumulating and intangible wonders surpass the wildest fancy, and no one can say what shall come next.

As we expected, the publication of Prof. Trowbridge's report on the triple thermic motor has called forth vigorous criticism in various quarters. The matter is referred to in another editorial paragraph, but we cannot help drawing special attention to the able communication on page 74 from Prof. Elihu Thomson. In view of the immense importance to the prosperity of electric lighting of economy in the engine room, the utmost investigation of these claims, or any others, is very desirable, and it is for this reason we have given our space to the statements and views of eminent experts.

MAJOR PANGBORN, of the Baltimore & Ohio, in a publication called "The Electric B. & O." gives a very interesting account of the building of Morse's first line from Baltimore to Washington. The original idea was to lay the wires in leaden pipes underground. Ten miles of the subterranean system was actually built, but like many of our modern underground systems it failed to work, and all the money spent—about $12,000 of the $30,000 appropriated by Congress—was lost. The wires were then placed on poles, and commenced a familiarity with forlorn kite-tails which is likely to last for some years. The early work is more fully described elsewhere in our columns.

DR. MOSES struck the key-note when he said at the Electric Light Convention that an arc lamp on an incandescent circuit was as desirable as an incandescent lamp on an arc circuit. We have seen small arc lamps burning on such circuits, and there can be no doubt that a demand can be secured for them if a suitable lamp can be devised. The electric light companies of Europe seem to have taken this subject up in a more serious manner than those here, and apparently with good success. Small arc lamps of 100 to 200 c. p., run in this manner, would make an excellent medium between the more powerful arc and the small incandescent lamp, and would, no doubt, find a large application. This opens a new field of enterprise, and we hope our electricians will not be slow to take advantage of it, and thus demonstrate that the arc light does not "stop at the door of the dwelling house," as seems to have been generally conceded at the convention.

WE give in another column the criticism of a mechanical engineer on the report of Prof. John Trowbridge, published by us last week, concerning the triple thermic motor. To the mechanical engineer the designation of such a document as an "engine-test report" must indeed be ridiculous. The child-like simplicity of determining the initial and final absolute temperatures, and from these data giving definite results, puts engine testing in a new light. With due respect to Prof. Trowbridge's known ability as a physicist, it is evident that engine-testing is no specialty of his, and that his reputation cannot be increased by the publication of such reports. But while the publication of the report can only produce a smile in professional circles, the importance which some interested parties attach to it may work injury to the investing public, and thus throw discredit upon inventions of real merit. There is, in short, nothing to prove that the "triple thermic motor" is an improvement upon any previous bisulphide of carbon engines which have uniformly been abandoned as impracticable.

A WRITER in the August *Century* on the subject of hotel-keeping makes one or two remarks of interest to electricians. On the subject of ventilation he says that the principal need for it arises from the use of gas, and that hotel keepers would rejoice more than any one else in the cheapening of the electric light to such an extent as to make it available. That stage has, we think, already been reached, and the light is preferable also on other grounds than economical. He suggests various additions to the electric call-bell service, recommending, in order to lessen noise, that instead of an alarm bell for clerk or porter, there should be used an incandescent lamp, whose momentary flash could not but be seen. He makes out a good case, too! for the more general employment of telephones in hotels, and goes so far as to advocate the placing of one in each room, so that guests could be in speaking communication with the hotel office and with each other at all times. There is a good hint here. The whole field of hotel management, as regards ventilation, lighting, power and communication, invites the further thought of the electrician.

WE publish to-day a very full report of the proceedings of the National Electric Light Association. It will be seen that for so young a body, the Association is possessed of remarkable vigor. It has in it the elements of permanency and has made a good bid for popularity in the last six months and at this week's meeting. The subjects discussed—some of which we are compelled to deal with briefly this week—were numerous and important. Discussion was throughout earnest and to the point, and all present must have felt that they were deriving benefit from active or even quiet participation. Valuable experiences and novel opinions were elicited touching every subject brought under consideration. It will be noticed, too, that the Association was not content with talking about the electric light in its scientific and practical aspects. A step was taken that may have a great and decisive influence on the future of electric lighting as a business. We refer to the endeavor to secure uniformity in the price of apparatus and of service.

THE arrangements for the meeting of the Telephone Association in Providence next month are already well advanced, we understand, and there is every promise of a profitable and enjoyable reunion. The list of papers to be read is an excellent one. It is considered likely that some changes will be necessary in the management of the body Mr. Morris Tyler, who has been President three years we believe, is desirous to make way for a successor. If not encroaching on the liberty of the members, we may suggest that it would be well to select a Western man for the office this time. There are several who could be named, and, without making invidious distinctions, we think we may say that first among their peers, in availability and fitness, are Mr. Fay, of Chicago, and Mr. Durant, of St. Louis. Rumors have been current that Mr. Fay is not unwilling to retire from active telephonic work, but he may be induced to serve. He would do the Association credit, and there are few presiding officers to compare with him. Then, as the Association meets at St. Louis in 1886, the claims of Mr. Durant an active and efficient telephonist, are weighty. As to the Secretaryship, it is a great pity that Mr. W. D. Sargent should contemplate resigning, as his friends report, but there can be no doubt that the work is a serious tax on the time and energy of any one having large business interests to watch the year round. If some arrangement were made for the performance of the clerical work in the Secretary's office, however, he might be induced to continue; but we regret to hear that his mind is made up on this point.

THE recent gathering of electric light representatives in this city is the best illustration of the rapid growth and prosperity of that new industry connected with the wide field of electricity. Readers of THE ELECTRICAL WORLD and its daily contemporaries have read, however, of the birth and growth of many such industries, not half a dozen years ago; their infancy, then their struggles against an incredulous public; next, their assured success, and then a "National Convention," at which the faithful pioneers sit down beside those who had been doubting Thomases, and all the world looks on in wonder. Nine years ago—at the Centennial Exhibition—we do not remember seeing an effective electric light, and we know that there were none then to be seen, while the telephone was shown only as an attractive toy; the American District service was practically unknown, and the electric railway was regarded as visionary. Then, after two years, in 1878, the "American District" service had grown important enough to hold a national conventiont. Two years later the telephone was in practical use all over the world, and, Sept. 7, 1880, at Niagara Falls, the first National Telephone Convention met. After that came the mandate "Fiat Lux." Aladdin's lamp was burnished up and there was electric light throughout the civilized world. Night was no more on land or sea, and electricity at night rivaled the sun by day. In Paris, London, New York, Philadelphia, Teheran, and even in far-away Siam the electric light burst forth to testify to the industry and intelligence of our electricians. Now that branch of the science must also have its National Convention, and on August 18 that vigorous bantling in the electrical world sends scores of delegates representing sixty-two electric lighting and electric manufacturing companies, to deliberate in this city! The *personnel* of this remarkable gathering was sufficient to assure us that the electric light is in good hands, even if their unprecedented success had not already put the question beyond all doubt. It is essential that the representatives of our varied science should meet periodically to discuss, collect, preserve and protect all matters of importance to their particular interests, and in the case of the electric light men this work is being thoroughly done.

Chat of an Old Timer.

A rather slenderly built and elderly man, in granger attire and Manilla straw hat, took a position in the square in the rear of the Boston City Hall the other afternoon. His bronzed and wrinkled face, silvery beard and stooped shoulders bespoke years of toil and no little exposure. After gazing steadily and with a sort of reverent air at the Sherman House near by, he remarked how changed things had become during the past forty years in that locality. From the drift of the conversation it appeared that the stranger was none other than Charley Porter, one of the pioneer telegraphers of this country, and who was in early life a most esteemed and personal friend of the great Morse, the inventor of the telegraph. The writer joining in the conversation, the veteran said, pointing to the present office of the Sherman House : "That was the spot from which I sent the first dispatch ever put over a telegraph wire from this city. We had just two wires up to New York and one to Portland. The dispatch was one of congratulation from F. O. J. Smith to Morse himself in New York. This was in 1847, and the feat was considered quite a great thing by the people here. I had previously worked with Professor Morse on the line between Baltimore and Washington, and, of course, knew the old man very well. Since then I have watched the great progress made in telegraphy, and in the construction of lines have worked in nearly every State and Territory in the country. I distinctly remember when Professor Morse sold three-quarters of his interest to three other parties respectively in Maine, New York and Washington; Mr. Smith, of Portland, who was very wealthy, taking in the territory of New England with his rights. Professor Morse did not die a rich man, but the others died worth barrels of coin.

"Let me tell you but few inventors ever make much out of their inventions. It's others who make the money. The progress in telegraphy and electric contrivances has been prodigious, but yet all have their being in the originality of Professor Morse, who was a kind-hearted and generous man." In reply to the query, if the four great owners were disposed to help the operators who were first with them by "letting them into the good thing," the veteran replied : "Well ! yes, I with others made a pretty good thing and again lost it. Young man, this is luck, you know, and just what one may expect in the ups and downs of the world." The veteran accompanied this latter remark with a quizzical expression of countenance, which deepened into a broad smile, which seemed to indicate that although he was not now a leading holder of Western Union, he was still healthy and happy. Porter is now nearly 60 years old, and seems good for many years to come.

Bazin's Rotative Battery.*

BY E. HOSPITALIER.

This battery, we understand, has been designed for the purposes of electric lighting, and the representatives in London are MM. Huon & Collet.

M. Bazin's apparatus is a combination of Poggendorff's bichromate battery and of mechanical depolarization by rotation, the principle of which is therefore very old.

Fig. 1 shows the arrangement adopted.

The zincs and the carbons are mounted upon one and the same axle, to which a slow and regular rotatory movement is communicated by the aid of a small electric motor supplied by a distinct element. The battery represented in Fig. 1 comprises eight elements, seven of which are utilized in the outer circuit; each element is composed of a disc of zinc placed between two discs of carbon; the liquid is contained in rectangular troughs, which hold each 3 litres. The immersion of the elements is regulated by raising up a platform on which all the troughs are placed. The immersion may vary from zero to one-third of the surface of the discs, according to the degree of exhaustion of the liquids.

The diameter of the discs, and the number of the elements in series, may be made to vary according to the duration of the effects to be produced in the outer circuit. M. Bazin has constructed other models with oscillating elements, but we have not had the opportunity of experimenting with them. In all the movement is communicated at once to the carbons and the zincs, which in our opinion is an inconvenience, since the liquid conveyed out of the element by the zinc during rotation is used in pure loss.

However it may be, here are without comments the results obtained in the best of the three complete discharges which we have had the opportunity of effecting with the rotative battery.

The battery used in the experiments comprised eight elements; one of these elements served to supply the motor which gives the axle supporting the zincs and the carbons a rotation of about one revolution per minute; the other seven elements are connected in series on the outer circuit, This outer circuit is composed, beside the connecting wires, of a resistance of 0.1 ohm in nickel silver, 6 millimetres in diameter, four Cruto lamps of 6 volts, arranged in parallel, and an ampèremeter.

The current was measured by taking the differences of potential at the extremities of the resistance of 0.1 ohm with a movable frame galvanometer (Deprez d'Arsonval's model) previously calibrated by a total resistance of 2,000 ohms, and giving under these conditions 50 divisions per volt on each side of the scale. The sum of the two readings gave the current directly in tenths of an ampère.

The same apparatus enabled us to measure the differences of available potential at the extremities of the battery, by raising the total resistance of the circuit of the galvanometer to 10,000 ohms.

The arithmetical mean of the two readings of each side of the scale gave this difference in tenths of a volt.

The corresponding available power in watts was ob-

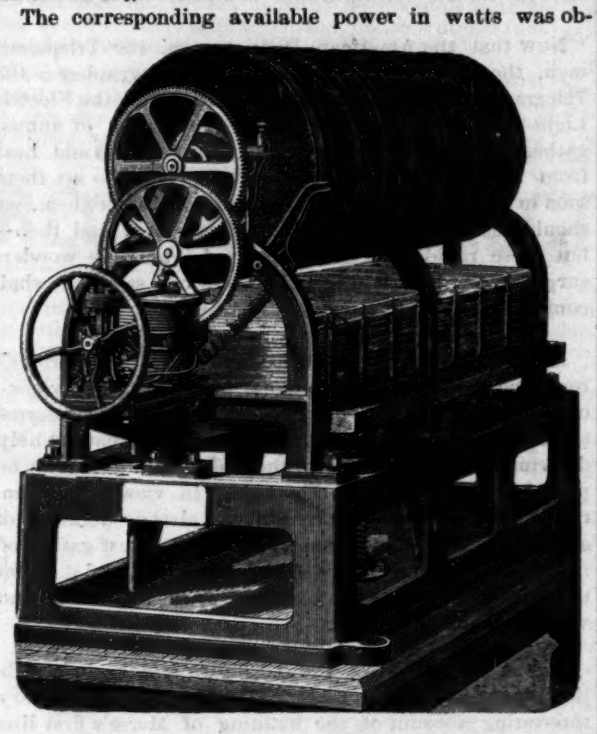


FIG. 1.—BAZIN'S ROTATIVE BATTERY.

tained by multiplying the current by the difference of potential.

The total quantity of electricity supplied, as well as the total electric energy, were obtained by measuring the corresponding surfaces of the subjoined diagram (Fig. 2) by means of Amsler's planimeter.

Each of the elements contained 3 litres of liquid. This liquid was an acidulated solution of bichromate of potash; 125 grammes bichromate, and 300 grammes sulphuric acid per litre.

The discharge was effected in three stages :

1. Continuous discharge for two hours (from 0 to 120 minutes). Stoppage of two hours twenty minutes.

2. Continuous discharge for one hour, with a greater immersion of the elements (from 120 to 180 minutes).

3. Total immersion of the elements and continuous discharge for 90 minutes, without stoppage between the second and third stages.

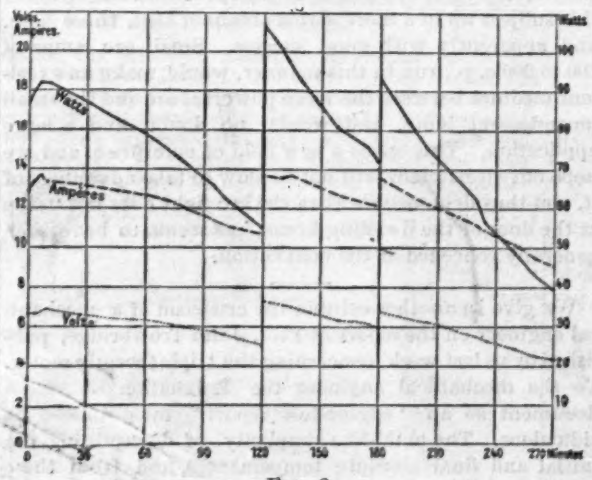


FIG. 2.

The elbows of the curves at the points 120 and 180 minutes indicate distinctly the augmentations obtained in the yield by the decrease of the internal resistance resulting from the increase of surfaces.

The subjoined table summarizes the principal conditions of the total discharge, the factors of which are shown at each instant by the diagram, Fig. 2.

Duration of discharge	4½ hours.
Quantity of electricity supplied	198,000 coulombs.
" " " "	55 ampère hours.
Total available work	0.45 h. p. hour.
Total consumption of zinc (motor not included)	1,226 grms.
Mean consumption of zinc per element	160.9 "
Effective consumption per ampère hour	2.93 "
Theoretic consumption	1.213 "
Ratio of the two consumptions	2.4 "
Mean power of battery during a discharge	75 watts.
Mean power of an element	10.74 "
Maximum power of an element	15 "
Initial electromotive power (7 elements in series)	13.1 volts.
Final electromotive power	11.9 "

If we calculate the consumption of the battery as referred to horse-power hours, and taking account of the circumstance that the seven elements during this discharge have yielded 0.45 horse-power hour, we find in round numbers :

Zinc	2½	kilos.
Bichromate of potash	5½	"
Sulphuric acid	13	"
Total volume of solution	45	litres.

Such are the present working conditions of the Bazin battery. To justify the insufficiency of these results, M. Bazin points out that our experiments have been made with the first apparatus constructed for his own studies, and necessarily incomplete. He promises by October next more perfect apparatus, in which we shall find decided improvements. We shall therefore await further experiments before passing a final judgment.

* L' Electricien.

Dr. Norvin Green Explains.

Dr. Norvin Green, president of the Western Union Telegraph Company, said on Aug. 14 to the reporters that he had not received permission of John Pender, of London, to publish the private memorandum of a plan by which the company might secure practical control of the Baltimore & Ohio system. Referring to the recent controversy between the companies, and particularly to the interview with President Bates, of the Baltimore & Ohio, which was printed in the *Herald* on Thursday, Dr. Green remarked:

"The assertion of Mr. Bates that this company is pecuniarily unable to buy the Baltimore & Ohio property is too ridiculous to need a reply. There is one point, however, in the interview to which I wish to call attention. His company is using our quadruplex instrument without even a pretense of an improvement. Usually companies which filch our inventions claim to have made some alteration, if only in a wheel or a spring, and on the strength of it declare that the instrument is not an infringement of our patent. The Baltimore & Ohio had the assurance to take our quadruplex just as we use it. We brought suit against the company recently and because we wished to bring it to a decision in the quickest possible time we began proceedings for infringement of Stearns' condenser, which is the essential basis of the quadruplex. Judge Wallace postponed the hearing on the application for an injunction until after his vacation. The case will come up, I suppose, some time in September. Mr. Bates quotes from my affidavit the statement that the Baltimore & Ohio is doing business at a large monthly loss 'with the sole purpose and expectation of compelling the Western Union Telegraph Company to either buy them out or to form a pooling arrangement.' Mr. Bates says that this assertion is utterly false, but I wish to reiterate it in the most emphatic manner. The extension of the Baltimore & Ohio system beyond the uses of the railroad line was begun simply for sale to the Western Union. Robert Garrett has said so on several occasions, before and after the extensions were begun. He has said explicitly that he was going to play the American Union game on Mr. Gould, and he has sought the aid of certain persons on this distinct ground. I have been told that he tried to secure the co-operation of the Vanderbilts, stating that he intended to make the Western Union buy the lines at a round profit. I cannot make public the names of the persons to whom he made these statements, but they are men of unimpeachable character. There are scores of men in the street to whom he explained his plan. Mr. Garrett is apt to be loquacious, and evidently in this case he spoke more freely than was prudent.

"As to the denials that Mr. Garrett has ever offered to sell his lines to the Western Union, I have this to say, that we refused overtures made before Mr. Garrett's departure for Europe. I cannot state explicitly that he offered to sell his telegraph property; perhaps he never did do so, but he showed a disposition to meet us more than half-way in a settlement of the contest. A mutual friend of both companies, who lives in Baltimore, wrote us in May proposing plans of settlement, and after some correspondence he came to New York to confer with us. He was acting for Mr. Garrett, and his letters prove that the proposals emanate from Mr. Garrett. They comprised a pooling agreement, and in one instance the agreement was virtually a perpetual lease. The plans were not wholly satisfactory to us, however, and the negotiations were brought to a close. So far as Mr. Bates is concerned, there never were any negotiations, for no one supposes that Mr. Garrett would consult him about a sale or lease of the property. Mr. Bates' treatment of my affidavit in the *Herald* interview was certainly not courteous. I have helped him out of several tough places, too, and at the time he seemed grateful, but perhaps he has forgotten those kindnesses. I have not forgotten what Judge Tuley of the Circuit Court in Illinois said of one of his affidavits in a suit brought by the Atlantic & Pacific against the American Union. The judge said in his decision : 'The affidavit of Mr. Bates might be justly criticised. It is very broad and comprehensive; indeed, too much so.'

"The *Herald* interview on the same day with that fellow who has been hounding the company for years is of no account. It quotes from my affidavit something that is not in it. Its statements are absolutely false. What I did say about the business of the Baltimore & Ohio was that the company was losing $300,000 or $400,000 a year. I placed the amount at about one-half of what I believed it actually was, and I had before me a transcript of the receipts and operating expenses for the previous month."

The Sperry Electric Light System.

During the past three years there has been developed in Chicago a system of electric lighting by the Sperry Electric Light, Motor and Car-brake Company, which possesses some new and interesting features.

Although the system was organized as late as 1883, there

FIG. 4.—SPERRY LAMP, DOUBLE.

are at the present time over 1,000 Sperry arc lights in nightly use in different parts of the country. Of these some 400 are in Chicago; 200 in Omaha, Neb.; 40 in North Platte, Neb.; 40 in Grand Island, Neb.; 40 in Ottumwa, Ia., with others in St. Louis, San Francisco and others in Eastern States. This system has also been adopted by the new Chicago Board of Trade, the American Express Company in Chicago, and the Chicago *Tribune*.

Steady progress has also been made in the development of their incandescent system, and very satisfactory results have been reached, several incandescent plants having been put out which are now in operation.

The company has also devoted considerable time to the development of a commercial electric motor, and with good results, quite a large number of their motors being now in use.

Certain other electrical appliances developed by the company will receive attention in these columns at some future time.

The company now occupy the works situated at Nos. 40 and 42 West Quincy street, Chicago, a three-story building 50 × 80 feet, and employ more than 50 men. Most of the heavy machinery is located on the first floor, and most of the lighter machinery on the second floor. The third floor is the finishing room, the laboratory being also located here.

The Sperry dynamo, which is illustrated in Fig. 1, is of

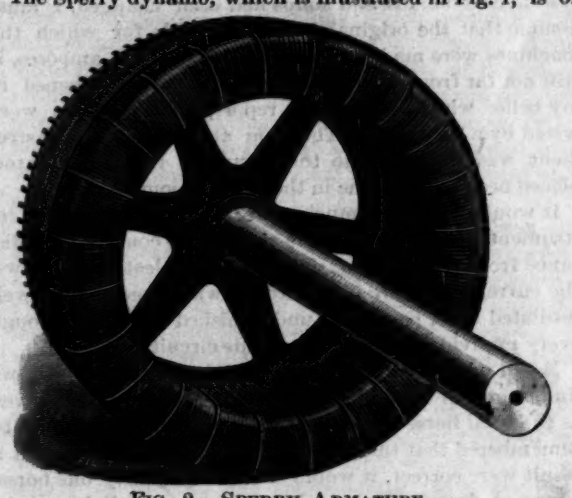


FIG. 2.—SPERRY ARMATURE.

the Gramme type, employing an annular armature with specially adapted core and mountings, together with a field magnet and pole-pieces peculiar to itself.

The armature and commutator, Fig. 2, are finely divided, so as to produce a continuous and even current, and the machine is of the type known as shunt-wound, the liability of burning out on short-circuit being thus avoided. The machines are built in various sizes ranging from one light to twenty lights. The small machine weighs about 80 pounds, and the twenty-light machine about 2,000 pounds. All the machines have a capacity sufficiently in excess of the normal to work on long lines and still not fall below their respective number of lights.

A glance at the illustration will show the departure made by the Sperry Company from the construction adopted by other manufacturers of dynamo machines.

The armature is built up of thin sheets stamped from sheet metal, every one being insulated from every other one, with an air space between each. This mass, as a whole, is held rigidly between heavy Swedish iron rings, one on each side, into which bolts are secured, which serve also to mount the armature, when completed, upon a heavy bronze spider, keyed to the armature shaft. The hitherto idle portion of the coils, which in usual forms lie along the internal surface and extremities, are here presented to the pole-pieces of the field magnets, and are thereby rendered productive of electro motive force.

The field magnets, as shown in Fig. 3, are composed of four cylindrical cores, from the end of which project two

FIG. 5.—SPERRY LAMP, SINGLE.

concentrically disposed pole-pieces of equal length, between which the armature revolves. The cylindrical part supports a small helix of fine wire, as shown. The peculiar disposition of the masses of metal forming these pole-pieces with regard to the masses of the core from which they receive their potential, has been demonstrated mathematically and experimentally to be the most advantageous. These cores are bolted to the yoke-piece, which also contains the rear journal of the machine, and which is supported upon a rigid cast-iron base.

The principal result of this arrangement is to enable the Sperry Company to build an armature with a very large and well-ventilated core, having upon it a minimum

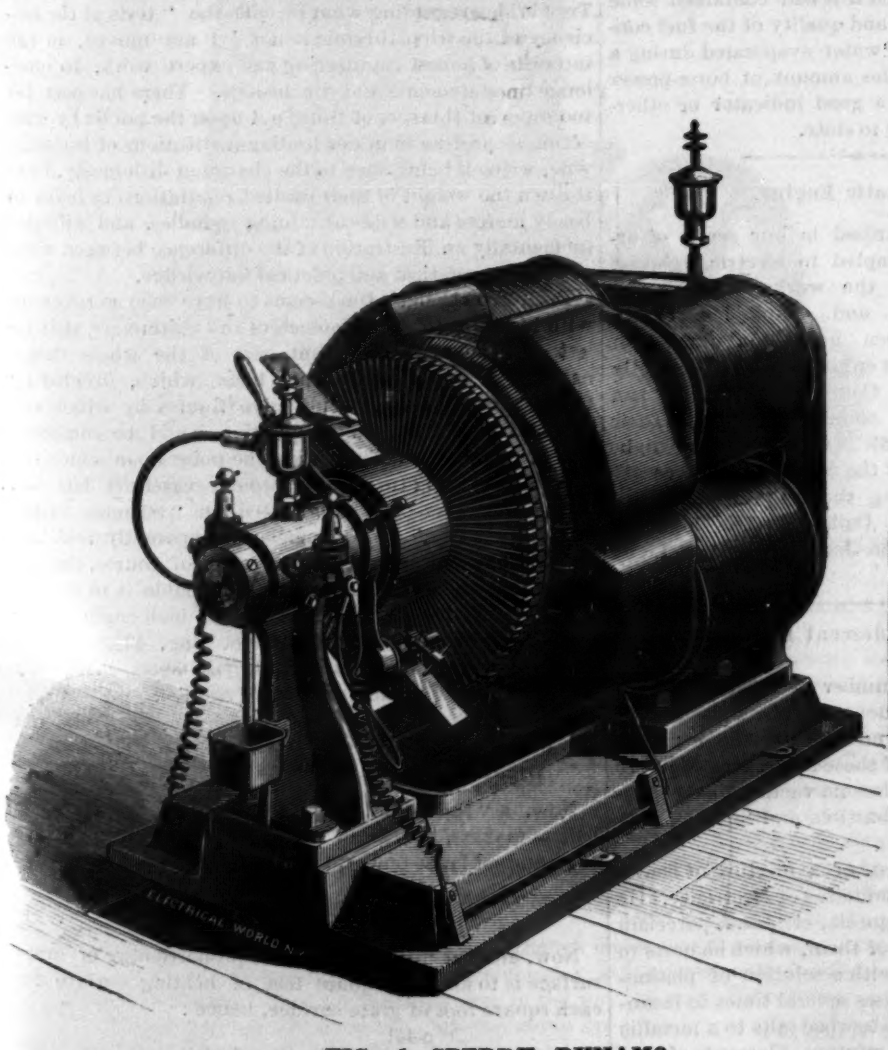


FIG. 1—SPERRY DYNAMO.

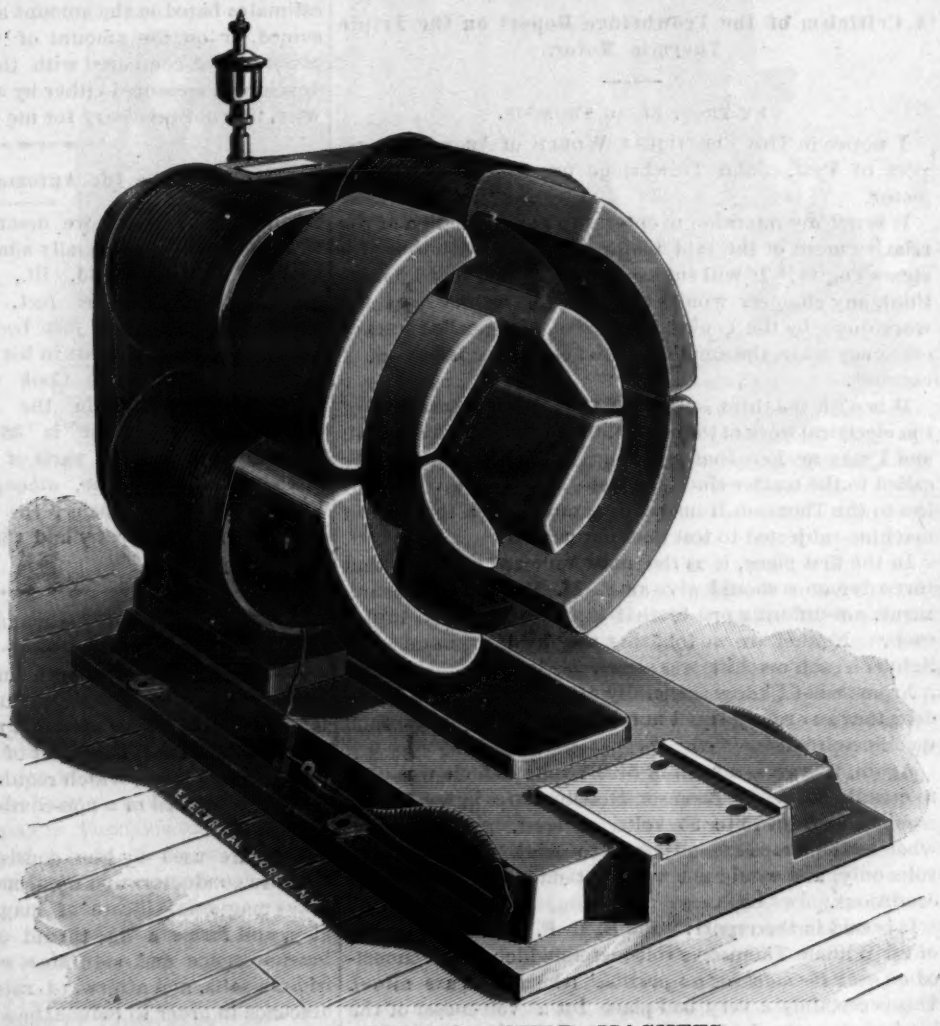


FIG. 3.—SPERRY DYNAMO FIELD MAGNETS.

weight of wire as compared with the energy it is capable of developing. In practice only two or three layers are employed for the development of the total energy of the machine.

The commercial advantage gained by the above-described arrangement of armature and field is one of the most salient features of the apparatus, because of the fact that nearly all of the armature conductor (ninety-two per cent. in practice) is rendered productive of current, and also because of the remarkably low internal resistance of the armature, thereby causing a very slight proportion of the total energy developed to appear on the interior of the machine.

The electromotive force of the armature is identical with that of the terminals of the exterior circuit, the field being maintained on a derivation as above mentioned.

The Sperry lamp presents a very neat and tasty appearance, as will be seen from the illustrations, Figs. 4 and 5. As before stated, there are upward of one thousand Sperry arc lamps now in operation in different parts of the country, and the results obtained have been most satisfactory.

The lamps are made in both single and double arc forms, and in construction the aim has been throughout to reduce the mechanism to the utmost simplicity, avoiding all clock, wheel or cog-work.

The current which feeds the arc is made to perform the office of regulation of the carbons with the fewest working parts. The object of the peculiar arrangement of magnets is to secure great sensitiveness. The shunt coil of the lamp is made the moving element, wound directly upon the cores, and, moving therewith, it stands in the best position, at all points in its movement, to exert the greatest possible neutralizing effect with the least amount of current in the by-pass circuit. Not only is this neutralizing effect observed in the core of the solenoid, but the direction of the currents being opposite, respectively upon the core and solenoid, there is an extra repellant tendency exerted between these two coils independent of the ordinary retractile tendency upon the core alone. This nearly doubles the sensitiveness of the action with a given change in the resistance of the arc.

The lamps are provided with automatic cut-outs which are set and operate upon a certain maximum length of arc, and upon the normal condition of the lamp again being established the same is automatically put into circuit. A convenient switch is provided upon the positive side for removing the lamp from circuit when desired.

The lamp throughout conforms to the rules and regulations of the underwriters, the frame-work being insulated from the circuit.

A Criticism of the Trowbridge Report on the Triple Thermic Motor.

BY PROF. ELIHU THOMSON.

I notice in THE ELECTRICAL WORLD of August 15 a report of Prof. John Trowbridge on the triple thermic motor.

It is not my intention to enter into any discussion of the relative merit of the said motor compared with that of a steam engine. It will suffice for me to say, that I hardly think any engineer would consider the estimates of the work done by the engine capable of being called tests of efficiency when the amount of fuel consumed is left out of account.

It is with the third estimation, *i. e.*, the measurement of the electrical work of the engine, that I have chiefly to deal, and I may say here that my attention has been particularly called to the matter since the tests, so called, give properties to the Thomson-Houston dynamos which the type of machine subjected to test does not possess.

In the first place, it is the most unheard of thing that three dynamos should give an E. M. F., upon measurement, not differing one-tenth (1-10) of a volt, *i. e.*, 1830. 7 each. Neither are we told that the load or number of lights on each machine was equal.

From what I know generally of such circuits, it is seldom that an exactly equal number of lights is put on each machine circuit.

Again, this gives a total of 5492.1 volts which was used to operate 60 or 70 Thomson-Houston arc lights. This would give from 75 to 85 volts, at least, per arc lamp, whereas the lamps are adjusted to work with 45 to 50 volts only, and would not work satisfactorily under other conditions.

It is said in the report: "the E. M. F. was tested by one of Sir William Thomson's volt-meters which was connected *as near the machine as possible*" (the italics are mine). This is certainly a very bad place for a volt-meter of the kind used, as the fields magnets of the machine could not fail to influence to a large extent the position of the needle of the volt-meter.

When it is remembered that in making electrical measurements, in order to avoid perturbations, it is usual to carry instruments as far as possible from the dynamo machines, and that there is no obstacle to doing this in the use of a volt-meter, which requires scarcely any current to be conveyed, the value of any tests made as "near the dynamo as possible" seems very questionable indeed. Besides, we are not told in the report whether any attempt was made to balance the error so introduced by reversing the connections. I do not know whether this was done or not, but suppose not, from the fact of the deflection having been given, and doubt whether, if the reversals had been made, any more than the merest approximation to a fine reading could have been obtained, because of the numerous causes of perturbation which would still have been present. It is only on the supposition that no compensation for such sources of error existed, that I can account for the figures as given.

The machines experimented with are manufactured to give a current strength very different from 8.57, 8.82 and 8.58 ampères, which strengths were reported to have existed in the tests; and unless the adjustment of the whole system of dynamos and lamps had been changed, I must assume that the original current strength for which the machines were made and regulated, *i. e.*, 9.6 ampères, is still not far from the true current. I am strengthened in my belief when I read in the report, "The currents were tested by a Sir William Thomson ammeter. The instrument was connected to the circuit at the commutator placed near the machine in the engine room."

It would have been much better to have inserted the instrument at a portion of the circuit at a considerable distance from the dynamo, since, as every electrician knows, the current in an arc light circuit, with presumably well insulated lines, passes in undiminished amount through every undivided part of the outside circuit.

Based upon the given E. M. F. and current strength, we find a total of 62.18 horse-power of electrical energy given as the total horse-power of the dynamos, but it must be remembered that this is electrical energy, and, if such a result were correct, it would show very nearly one horse-power of electrical energy delivered to each light on the circuit, because the other resistances present with the lights would be comparatively small in amount.

Now, the actual energy demanded by Thomson-Houston arc lights, under normal conditions (and I believe that the lamps used in the tests could not have differed much from these conditions), is not more than 500 watts per lamp, which, with 70 lamps, would give, in round numbers, 47 horse-power as the total electrical works on the circuits. I have assumed the higher figure of 70 arc lights, although there is nothing in the report to indicate that the number might not have been 61.

I mention the above facts simply to show that no arguments based upon the so-called tests can be of any value, and I am confirmed in this opinion when I find that the efficiency of the dynamo as a converter of mechanical energy into electrical energy is entirely left out of account in the estimates made.

How much more satisfactory a report on the triple thermic motor would have been if it had contained some estimates based on the amount and quality of the fuel consumed, or on the amount of water evaporated during a given run, as compared with the amount of horse-power developed, measured either by a good indicator or otherwise, it is not necessary for me to state.

The Ide Automatic Engine.

This engine, which we described in our series of articles on engines specially adapted to electric lighting, is built in Springfield, Ill., the works occupying a space of 100 × 150 feet, and employing eighty men. Mr. Ide has just been granted a number of patents on improvements in his engines, and has recently sold five of them to Cook County, Illinois, to run incandescent lights in the county buildings. Their aggregate horse-power is 385. Other electric light companies in various parts of the country have recently introduced this engine, among them the Kansas City Electric Light Company, the Dallas Electric Light & Water Supply Company and the Jacksonville Gas Light & Coke Company.

The Muthel Incandescent Lamp.

Notwithstanding the large number of substances tried in seeking for a durable filament for the incandescent lamp, the field is still open and new forms are constantly brought forward. The latest of these is Mr. Max Muthel's incandescent lamp, which requires no vacuum, as the filament is composed of a non-combustible and infusible substance.

The wire used by him consists of a mixture of bodies that are conductors and non-conductors of electricity. He takes magnesia, silicate of magnesia, etc., and porcelain clay, and forms a fine thread of them, which he heats to incandescence and saturates with a solution of platino-iridium salts, and afterward raises several times to incandescence in order to reduce the absorbed salts to a metallic state. Instead of the foregoing mixture, filaments of clay may be taken and saturated with a solution of a metallic salt, which is then reduced to a metallic state through incandescence and the use of oil of lavender or some other organic substance, or through an electric current. With wires thus prepared fusion is absolutely overcome, the presence of the non-conducting substances preventing the metallic parts from melting. Mr. Muthel supposes that the electric spark jumps, so to speak, from one particle to another, and in this way causes a heating of the other substances, which, brought to incandescence, emit a more intense light. In order to make the filaments stronger, they may be covered with chrome, the melting point of which is still higher than that of platinum. To effect this, the filament is placed as the anode in a bath of chloride of chromium.

We have not as yet seen the results of any tests of lamps constructed in this manner, but Mr. Muthel's explanation of the spark action would seem to argue against the long life of the lamp, being an admission that the filament disintegrates rapidly.

Another Decision as to Delivery of Telegrams.

Justice Miller, of the United States Supreme Court, holding Circuit Court in Iowa, has just decided a case involving several interesting points touching the duty of a telegraph company with respect to delivery of messages. One of the points is this: A man in Chicago sent a message to another in Des Moines, asking him to come immediately to Chicago to accept a business proposition. The latter was the private secretary of the Governor of Iowa. When the message was received at the telegraph office in Des Moines, the operator telephoned to the Governor's office asking whether the secretary was there. Reply came back that he was out of town and would not return for two days. Thereupon the message was sent to his house and delivered to his wife. At the same time the company sent a dispatch to the sender informing him that the secretary was out of town. The latter did not receive the telegram addressed to him till the next day, and in consequence lost the business opportunity offered.

He sued the company for damages. Justice Miller holds there was no negligence on the part of the company. He says: "When informed that plaintiff was out of the city and would be for two days, the company did the precise thing which it ought to have done—namely, delivered the message to his wife at his residence, and thus enabled her, the most likely of all persons in the world to know where her husband was, to send the message to him immediately. If she did not know where he was, it was the fault, if fault was in any one, of the plaintiff, who had neglected to inform her. The dispatch remained in her hands from half-past four P. M. until nine minutes past seven P. M., and during this time the golden opportunity was lost. We think this was contributory negligence sufficient to defeat the action."

A Mechanical Engineer on the "Triple Thermic."

Mr. William H. Harrison, mechanical engineer, Braintree, Mass., offers the following criticism on Prof. Trowbridge's report:

My attention having been called to the report of Prof. Trowbridge regarding what he calls the "tests of the efficiency of the triple thermic motor," I am moved, in the interests of honest engineering and expert work, to challenge his statements and conclusions. There has been far too much of this sort of thing put upon the public by men acting as professors in our leading institutions of learning, who, without being open to the charge of dishonesty, have thrown the weight of their exalted reputations in favor of Keely motors and wild-cat mining swindles, and afforded incidentally an illustration of the difference between what as called theoretical and practical knowledge.

Prof. Trowbridge's time seems to have been so taken up with his indicators, thermometers and voltmeters, that he left out the most important part of the whole thing, namely, the coal consumed per hour, which, divided by the indicated power, would give figures by which the economy of the system in question could be compared with a steam plant. This, being the point upon which the value of the thing turns, is apparently carefully left out, and in place thereof is substituted an "estimate of the size of the boiler," which somebody apparently told him was 30 horse-power, and the marvel is, of course, that an apparatus can be attached which will enable it to develop 60 or 70 horse-power in a 14 inch by 28 inch engine. The figures he gives for the boiler, 12 feet long, 42 inches diameter, 41 tubes, 3 inches (outside?) diameter, enables any one to get the following calculated results:

Heating surface, under side of shell.....	66	square feet
Heating surface, 41 tubes, 3 inches outside.....	385	" "
Heating surface, total.....	451	" "

Now, a "rule"—and a good one in its way—among boilers makers, is to allow 15 square feet heating surface per nominal horse-power, thus:

$$\frac{451}{15} = 30 \text{ horse-power.}$$

Now, another "rule" for for the proportioning of grate surface is to allow 30 square feet of heating surface for each square foot of grate surface, hence:

$$\frac{451}{30} = 15 \text{ square feet.}$$

The Professor gives the size of the grates at 42 × 54 inches = 2,268 square inches = 15.75 square feet; and the rule is well followed.

Now, a boiler of this class, when clean and in good order, will evaporate eight pounds of water for each pound of good coal burned on its grates. And with Cumberland coal, a rate of 14 pounds coal per square foot of grate may be maintained, and the total evaporation of water per hour from this boiler may be 8 × 14 × 15.75 = 1,764 pounds. Now, a fairly good steam engine, such as

a dozen makers in this country would put in and guarantee, would require 24 to 26 pounds of water evaporated per hour for each horse-power developed in the cylinder, and

$$\frac{1,764}{26} = 75 \text{ horse-power."}$$

instead of the 30 horse-power by the Professor's "estimate." Now for his conclusion, "that it would have been impossible for the engine employed to do this amount of work."

The amount of work he gives at 62 horse-power on the dynamos. Call the lost work in friction, etc., 8 horse-power and we would require 70 horse-power indicated—though he does not give even that simple check.

The size of the engine is 14 inches ×28 inches. The net area of the piston is 150 square inches, and the speed at 100 revolutions per minute would be

$$\frac{28 \text{ inches} \times 2 \times 100}{12 \text{ inches}} = 466 \text{ feet per minute.}$$

$33,000 \times 70 = 2,310,000$ foot pounds work done per minute at 70 horse-power indicates then

$$\frac{2,310,000}{466 \times 150} = 33 \text{ pounds mean pressure per square inch required on piston.}$$

This is common every-day practice, and is obtained with steam of 70 or 80 pounds boiler pressure, cutting off at $\frac{1}{10}$ or $\frac{1}{4}$ the stroke, and with a reasonably good engine and boiler the coal cost would be 210 pounds per hour.

In other words, my conclusion, derived from his own figures and statements, is in direct opposition to that of Prof. Trowbridge.

Electric Railway in Baltimore.

A meeting of the Board of Directors of the Baltimore & Hampden Railway was held recently in Baltimore. They expressed themselves as being much gratified at the success of the electric motors which have taken the place of the horses on their line. The motor weighs about 4,500 pounds, and with the ordinary horse car attached, with its quota of passengers, can make the trip to Woodberry and return, about four miles, in less than twenty-five minutes. The road is up-hill nearly all the way to Woodberry, and in one place, just beyond the bridge over the Delta Road, is very steep and at the same time makes a considerable turn. It is not proposed, however, to run the motors at an excessive rate of speed, as the road along the railway is quite a thoroughfare for people living at Hampden, Woodberry and beyond, and too great speed might result in accidents to passers-by.

The motors are now transporting passengers, though on account of some temporary difficulties are running at rather long intervals. The only difficulty now in the way of the permanently successful working of the motor system is the fact that there is some little danger to stock and horses receiving a shock from the middle rail. The directors, however, at their meeting this week decided to obviate this danger by placing planks on each side of and a short distance higher than the middle rail. This has already been done at road crossings, but, in spite of cautions elsewhere, has been found to be necessary the whole length of the road.

The experiments on the Baltimore & Hampden line have demonstrated the practicability of the motor system, which moreover, does away with dust, cinders, smoke and noise, for the motor moves along with hardly any sound, except a low, hissing noise, which, it may be said, will not be heard after the motors have been running some little time.

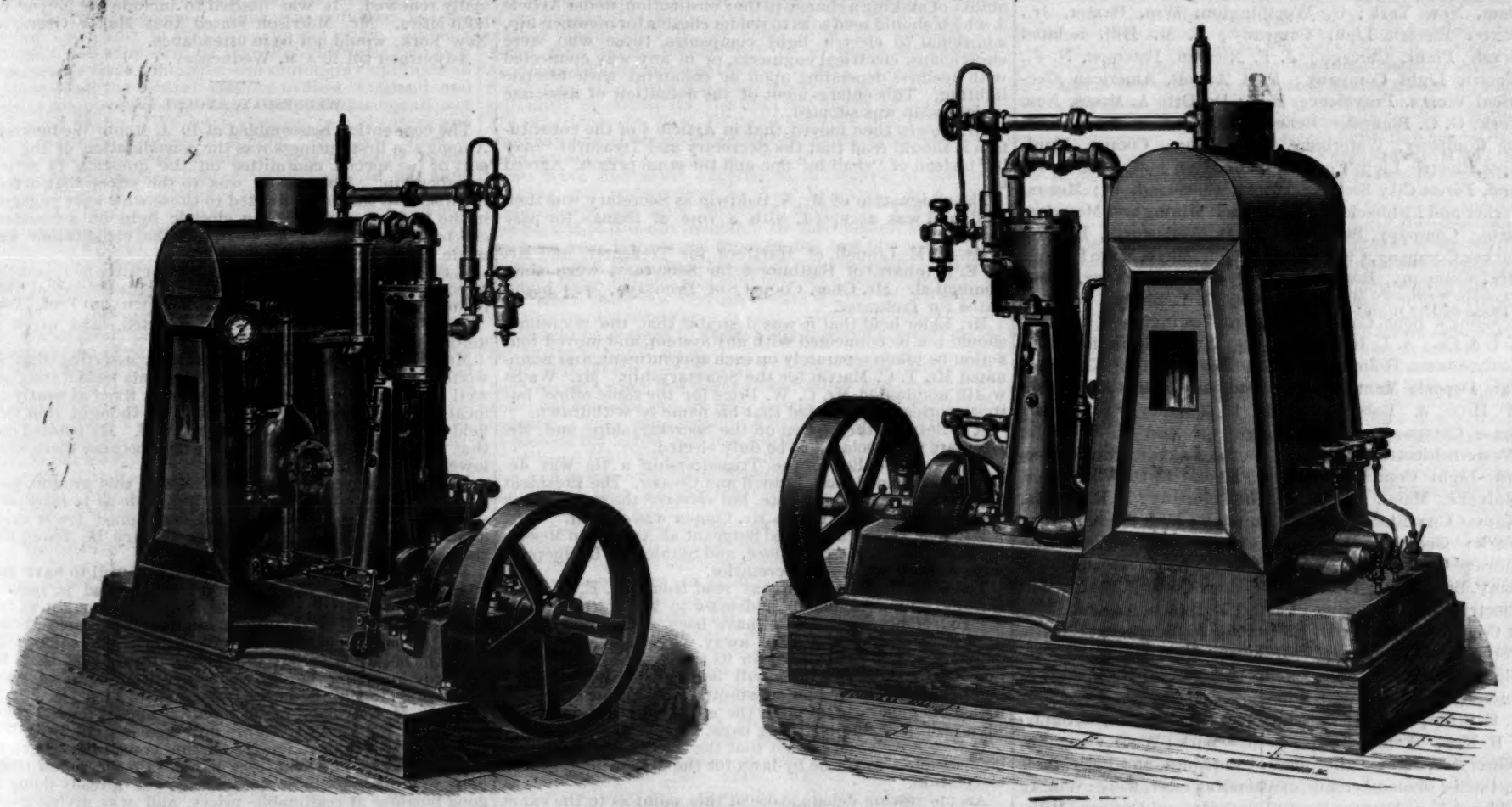
The Shipman Automatic Steam Engine for Domestic Electric Lighting.

There can be no doubt that the success of domestic electric lighting depends to a large extent upon the degree to which the lighting plant can be left to take care of itself. With a small dynamo which is self-regulating there is thus required, too, a small engine which shall regulate itself automatically, and in the same way keep itself in working condition without further attention after once being started. An engine which seems well calculated to fulfill these requirements is the new "Boston" model of the Shipman Engine Company, of Boston, and recent trials have shown it to be eminently adapted to the purpose. Our engravings, Figs. 1 and 2, show, respectively, the front and rear view of the engine and boiler, which are intimately connected and are mounted on the same bed plate.

The fuel used is kerosene, by the use of which a small amount of storage room is required, while the expense of a fireman and the accumulation of dirt and ashes are avoided. The fire is formed by the pressure of steam flowing through an atomizer, which throws the kerosene in a very fine spray into the fire-box. This causes an intense blast of fire. In this way the oil is consumed without the agency of wicks, while the combustion of the fuel is so perfect that there is little or no smoke, and the full value of the heating qualities of the fuel is obtained. The intensity of the fire, and consequently the generation of steam, is controlled by means of a diaphragm which regulates the amount of steam-blast to the atomizer. Thus, as the pressure increases to a certain point, the blast is gradually diminished, until a point is reached at which it is entirely cut off.

Thus when no work is being done the consumption of fuel is stopped automatically. The boiler is fed continuously and all parts requiring lubrication are provided with oil cup and sight feeds where required.

We have seen the Shipman engine in operation and do not hesitate to say that for domestic electric lighting it offers a safe and economical motive power. We may remark here that a gentleman in Pennsylvania is about to use one of these engines of 2 h. p. to light up his residence. A system of wires has been arranged whereby he will, from his own chamber, put out the fire when he wishes to stop the engine. As yet the engine is built in two sizes only, 1 and 2 h. p., but one of 4 h. p. will shortly be ready for delivery.



FIGS. 1 AND 2.—SHIPMAN AUTOMATIC STEAM ENGINE.

The Early Days of Telegraphy.

It is a curious commentary on the progress of telegraphy that Professor Morse, in his original plan for building his first line between Washington and Baltimore, not only proposed to do it but actually laid the first ten miles from Baltimore north underground. That was in 1843. The Baltimore and Ohio Telegraph Company, in a recent publication called the "Electric B. &. O.," gives a detailed account of the laying of the first wire, which was to unite Washington with an electric current via the branch of the Baltimore and Ohio to that city. After Congress had made an appropriation this company was granted permission to build along its line and rendered important aid. It is known to the few that the first plan was to lay the wire in a lead pipe underground, and that the resort to poles was not thought of until the trench encountered the solid masonry at the viaduct at the Relay House. This part of the interesting story is told by Major Pangborn, who compiled it from the company's records, and from information obtained from prominent actors in the matter at the time.

"The resolutions by which the Board of Directors agreed to extend aid was as follows: '*Resolved*, That the president be authorized to afford to Mr. Morse such facilities as may be requisite to give his invention a proper trial upon the Washington road; provided in his opinion and in that of the engineer it can be done without injury to the road and without embarrassment to the operations of the company, and provided Mr. Morse will concede to the company the use of the telegraph upon the road without expense, and reserving the right of discontinuing the use if, upon experiment, it should prove injurious.'"

"There are still living quite a number of the railroad employés who remember the preliminary proceedings, and who were frequently in consultation with Morse himself as well as those engaged with him in the work. They all agree the matter of poles was not mentioned at first and the discussion was confined to the underground plan. Mr. Latrobe says the line was to have been laid in a trench dug in the road-bed, and in none of the reports where mention is made is the question of poles referred to. The probabilities are the stretching of wires above ground was not considered until the plow with which the trench was made, not upon the road-bed, but on the company's right of way, reached Relay and the viaduct at that point.

"Here it was impossible to continue, as the viaduct was of stone, and as a matter of course not to be plowed. The carrying of the line so as to be out of the reach of the curious and mischievous necessitated its being run over the viaduct on poles. However, before this emergency arose, the buried section became practically useless, as the current could not be maintained, and all the money spent—some $12,000 of the $30,000 appropriated—was as good as thrown away.

"Luckily it was no more, and with the assistance so freely extended by the railroad company, in the way of machinery and transportation, the crisis was averted. The plow by which the line was laid from Baltimore to Relay was a ponderous implement, showing no ordinary ingenuity in its construction. The plowshare was cast by the present foreman of the molding room at the railroad company's shops at Mount Clare. It made a furrow two inches wide and twenty inches deep, feeding the leaden pipes, in which the wires were encased, from the bottom.

"In the top of the beam of the plow was a cylinder holding some sixty feet of the pipe, which uncoiled and passed down over little pulleys in the rear edge of the blade of the plow to the earth, uncoiling the line, as heretofore stated. A plumber, with his fire-pot and soldering irons, followed immediately in the rear, and as the supply on the cylinder ran short, would step up, wind on a new section, wipe or join the ends and thus keep up the operation of laying the line."

National Electric Light Association.

At a meeting of the Executive Committee of the above association, held in New York on the 9th inst., it was resolved to hold the second general meeting at the Hotel Dam, Union Square, New York, on Aug. 18. In accordance with this plan, the usual notifications and invitations were sent out by President J. Frank Morrison and Secretary George S. Bowen, and as a result of their endeavors there was a very good attendance when the association convened at 2 P. M. on Tuesday last. Among those present as active and associate members and visitors were: J. F. Morrison, of the Southern Electric Company and Brush Company, Baltimore; George S. Bowen, Van Depoele Mfg. Company, Chicago, and Elgin, Ill., Electric Light Company; Elmer A. Sperry, Sperry Electric Light, Motor and Car Brake Company, Chicago; A. F. Upton, Jarvis Engineering Company, Boston; G. F. Porter, Pittsburgh Carbon Company; S. A. Duncan, Allegheny County Electric Light Company, Pittsburgh; W. O. Callender, W. M. Callender and C. M. Thompson, Callender Insulating Company; H. M. Cleveland, Schuyler Electric Light Company, Hartford, Conn.; J. J. Moore, Springfield Electric Light Company, Springfield, Mass.; J. Jepson, Norwich Electric Light Company, Norwich, Conn.; H. W. Spang, Ball Electric Manufacturing Company, Reading, Pa.; Everett Morss, Morss & Whyte, Boston, Mass.; J. F. Kelly, Electrical Supply Company, New York; G. D. Allen and Wm. Hochbausen, Excelsior Electric Company, New York; A. J. De Camp, Brush Company, Philadelphia; W. H. Baker and J. S Elder, American Electric & Manufacturing Company, New York; D. W. Guernsey, Guernsey & Scudder, St. Louis; C. C. Curtiss and A. J. Holt, Brush Electric Company, Cleveland; Ralph W. Pope, New York; Messrs. Waring, Marsh and G. L. Wiley, Standard Underground Cable Company; A. J. Dam, Hotel Dam, New York; G. Worthington; Wm. Baxter, Jr., Baxter Electric Light Company; J. M. Hill, isolated Brush Plant, Chicago; J. F. Noonan, Paterson, N. J., Electric Light Company; Fred Angell, American Electrical Works, Providence, R. I.; Dr. Otto A. Moses, New York; G. G. Blakeslee, Benedict & Burnham Manufacturing Company, Waterbury, Conn.; Chas. Cooper, Municipal Electric Light Company, Brooklyn; Wm. B. Cleveland, Forest City Electric Works, Cleveland, O.; Messrs. Parker and Fishback, Parker-Russell Mining and Manufacturing Company, St. Louis; G. H. Wadsworth, Boulton Carbon Company, Cleveland, O.; G. A. Mayo, Mayo Electric Mfg. Company, Boston; F. Ridlon and P. Fahey, Brush Electric Light Company, Boston; H. L. Shippy, John A. Roebling's Sons Co.; W. C. Kerr, Westinghouse, Church, Kerr & Co.; A. L. Ide, Ide Engine Works, Springfield, Ill.; H. C. Adams, Holmes, Booth & Haydens; A. K. Stiles, Van Depoele Manufacturing Company: Mr. Robertson, of Hine & Robertson; H. D. Stanley, Bridgeport Brass Company; F. W. Harrington and C. A. Rolfe, Western Electric Company; W. W. Leggett, Brush Electric Light Company, Detroit, Mich.; R. C. Winchester, Holyoke, Mass., Electric Light Company; E. R. Weeks, Kansas City Electric Light Company; F. J. Sprague, New York; Geo. H. Benjamin, Constant Current Electric Storage Company, New York; F. W. King, Brush Company, Baltimore; T. Officer, Pilcher Council Bluffs, Ia., Electric Light Company; Gilbert M. Smith, Ansonia Brass & Copper Company; D. H. Tuxworth, Southern Electric Company, Baltimore; J. English, New Haven Electric Light Company; J. N. Candee, Brooklyn, N. Y.; W. J. Buckley, Chicago; W. J. Johnston, T. C. Martin, J. Wetzler, C. E. Stump and W. T. Hunt, THE ELECTRICAL WORLD; J. B. Key, Okonite Company, New York; W. H. Coughlin, Worcester, Mass. Other firms, companies, and individuals on the list of membership, or attending later, were: Wm. L. Libby & Son, Boston, Mass.; Riverside and Oswego Mills, Providence; Poughkeepsie, N. Y., Electric Light and Power Company; H. M. Linnell, Schuyler Electric Light Company; Springfield, Ill., Steam Supply and Electric Light Company; Daft Electric Light Company, Greenville, N. J.; North Adams, Mass., Electric Light Company; Bridgeport, Conn., Electric Light Company; Armington & Sims Engine Company; Mitchell, Vance & Co.; Brush-Swan Company, of New England; Swift Electric Light Company, East Saginaw, Mich.; J. E. and H. Condict, San Francisco; Brush Electric Illuminating Company, New York; Clark B. Hotchkiss, New York; Royal Electric Light Company, Montreal; Thomson-Houston Company, Philadelphia; Worcester Electric Light Company, Worcester, Mass.; Fort Wayne Jenney Company; Minnesota Electric Light Company; Minneapolis Consolidated Electric Light Company, of Maine; Brookline Electric Light Company, Brookline, Mass.; G. Donaldson, Electrical Works, St. Paul, Minn.; La Crosse Electrical Light Co.; Mr. O'Beirne, Star Tower Co., Fort Wayne, Ind.; Electrical Supply Company, Chicago; Albany (N. Y.) Electric Illuminating Company; O. L. Jones, Domestic Electric Light, Heat and Power Company, Boston, Mass.; Brush Electric Light Company, Indianapolis; C. W. Price; H. H. Fairbanks; A. F. Moore, Philadelphia.

Mr. Morrison: Six months have passed since the meeting in Chicago, during which time some members have given attention to the subjects then partially discussed, and they have come prepared to discuss them now in an even more intelligent manner than then. I will, however, take up only so much of your time as may be necessary to name the different subjects which will be presented before you for consideration. There will be action and a change of the constitution necessary in consequence of the resignation of the Secretary and Treasurer. Among the subjects for discussion are the proper insulation of lines; the feasibility and cost of underground wires for electric lighting purposes; the desirability of lighting from towers as compared with lighting from poles; the comparative cost of producing electric light by steam power and water power; electromotors and their relation to electric lighting; the best form of dynamo; the advantages of the electric light over other illuminants for street purposes. Major Heap, of the U. S. Lighthouse Board, is expected to address you on the subject of electricity for lighthouse purposes. I presume that during the convention various other matters will crop up to attract the attention of the members, and will be exhaustively discussed.

There is one thing of which, perhaps, it is well to warn you ahead, if that term be admissible, that an effort will be made during this convention to establish business relations between the various working companies that may lead to the insuring of uniform prices for electric lighting in the different parts of the country, and that without regard to the system by which the light may be produced. At the same time and in that connection an effort will be made by the consumers—calling the working companies here the consumers as distinguished from the producers and manufacturers of electric light apparatus and supplies—to bring about an equalization of price among the different manufacturers, so that instead of destroying each other, the companies may be brought together in friendly relations to their mutual benefit, thus compelling fairer play than can now be coaxed out of what are known as the parent companies as well as the manufacturers of machinery and carbons.

I now declare this convention open for the transaction of business. The report of the Executive Committee is the first business.

Mr. G. S. Bowen then presented a report showing that $620 had been received from 62 members as dues. Since the report had been prepared, three new names had been added to the membership list. There had been expended $415.67, for which vouchers were submitted. The statement was received and approved.

Mr. Bowen then addressed the meeting as to the desirability of making a change in the Constitution, under Article 3, which should read so as to render eligible for membership, additional to electric light companies, those who were electricians, electrical engineers, or in any way connected with business depending upon or collateral with electric lighting. This enlargement of the definition of associate membership was adopted.

Mr. Bowen then moved that in Article 4 of the constitution it should read that the Secretary and Treasurer "may be" instead of "shall be" one and the same person. Agreed to.

The resignation of Mr. S. Baldwin as Secretary was then read, and was accepted, with a vote of thanks for past services.

Mr. H. M. Linnell, of Hartford, for Treasurer, and Mr. H. E. Leinhart, of Baltimore, for Secretary, were then nominated. Mr. Chas. Cooper, of Brooklyn, was nominated for Treasurer.

Mr. Elder held that it was desirable that the Secretary should not be connected with any system, and moved that action be taken separately on each appointment, and nominated Mr. T. C. Martin for the Secretaryship. Mr. Wadsworth nominated Mr. C. W. Price for the same office, but that gentleman requested that his name be withdrawn.

A ballot was then taken on the Secretaryship, and Mr. Leinhart was declared to be duly elected.

On the first ballot for the Treasurership a tie was declared between Messrs. Linnell and Cooper. The President did not record a casting vote, but referred the matter back to the meeting, whereupon Mr. Cooper was elected.

Mr. A. J. Dam was elected Sergeant-at-Arms, and Messrs. Richard Garrett, of Baltimore, and Stanley, of Bridgeport, were elected Assistant Secretaries.

The following telegram was read from Mr. E. H. Goff, Boston, Mass., August 18, addressed to Mr. Morrison:

"Extremely sorry not to have been with you to-day; important business calls me away. Please extend to the convention my best wishes for its success, and the sincere hope that the deliberations will be wise and business-like and calculated to render substantial aid in the efforts of managers generally to place the electric lighting business on a profitable and enduring basis."

It was moved and carried that the Executive Committee be instructed to frame by-laws for the government of the association.

An interesting debate arose at this point as to the exact definition and limitation of "active membership," Mr. Porter representing the Pittsburgh Carbon Company, as an associate member, asking for recognition as an active member, as his company operated a private plant. It was later stated that this plant was in the works of the company, and consisted of a Brush one-light machine feeding one lamp.

Mr. Leggett made a motion that Article 2 of the constitution be construed to mean companies doing a lighting business, and not parties running a plant for their own purposes.

Mr. Wadsworth put forward a strong argument for the admission as active members of the representatives of mills having plants of electric lights. It was desirable to have their experience. They operated all the systems known in the United States, and inducements had been held out to them to come, with the understanding that they were to be fully admitted. They represented a very large number of lights and a very large investment in the business, and it would be entirely wrong to say that they could not come in

Mr. Leggett said he wished to have mill representatives there, but they need not come in as active members. They could get all the benefits of the discussions without that.

Mr. Wadsworth replied that it was anomalous to let in as an active member one who was running a small business plant, and to shut out the representative of a mill using a very much larger number of lights for itself.

Mr. Duncan opposed the wholesale admission of all who wished to become active members, and was in favor of running the Association from the business stand-point of enrolling as active members those only who were selling and renting lights.

Mr. Morrison made a very forcible speech against the admission of Mr. Porter, on the principle that the Association was primarily for those in the lighting business. When the question of forming the Association was first mooted, this matter was one of the stumbling-blocks in the way. The line was then drawn at the user of electric light plants, as entitled to active membership, but it was understood, of course, that the plant was to be of a sufficiently large number of lights to give it a place in the consideration of electric light men. He wanted to ask the members, therefore, whether they thought that a gentleman running a one-light Brush machine with one lamp, in a carbon factory, and representing the carbon interest absolutely and entirely, had sufficient interest to entitle him to the benefits of active membership. That was not the intention of the former convention. It was the intention of the framers of the constitution, and of the gentlemen who voted upon it, that its beneficial results should accrue to those who were actively engaged in the lighting business. He assumed that it was not the intention of the convention to depart from that principle as first adopted. Those who were associate members received the full value of their dues in being brought face to face with the men who consumed their products, and in hearing the discussions.

Mr. Fishback pointed out the fact that his concern, the Parker-Russell Company, had only an associate membership, while the Boulton Carbon Company had an active membership.

Mr. Wadsworth replied that his company ran more than thirty lights belonging to four arc systems.

Mr. Leggett drew attention to the fact that the list of subjects for discussion had been drawn up with an eye solely to the needs of those doing a lighting business.

Mr. Wadsworth said he was in favor of the inclusion of all, or the exclusion of all not actively engaged, whether makers of carbons or manufacturers of apparatus, or even of a certain limitation as regards the number of lights operated.

After further animated but somewhat confused discussion, it was agreed, on the motion of Mr. King, of Baltimore, that a committee of three be appointed by the chair to report next morning on this subject. A committee was appointed, consisting of Messrs. Cooper, Weeks and Leggett.

An invitation having been sent to the Electrical Subways Commissioners of New York and Brooklyn to attend the convention and participate, it was, on motion, specially renewed. It was desired to include the Mayors of both cities. Mr. Morrison stated that Mayor Grace, of New York, would not be in attendance.

Adjourned till 10 A.M. Wednesday.

WEDNESDAY, AUGUST 19.

The convention reassembled at 10 A. M. on Wednesday. Among the first business was the consideration of the report of the special committee on the question of active membership. The report was to the effect that active membership should be limited to those who were engaged in the business of furnishing electric light on a commercial basis. This was adopted, and the constitution was made to read accordingly.

A resolution was presented that a committee be appointed to consider the question of entertaining the subject of uniform prices for apparatus and service.

Mr. Cooper and Mr. Duncan objected, and urged a motion that the resolution be tabled.

Mr. Weeks supported the resolution, asserting that it would be well to have the cost of plants looked into, as well as to have uniform rates of service fixed as nearly as local circumstances would permit. He thought that this field should be investigated and explored. He pointed out that patrons often asked for lower rates because there were lower rates given in other cities.

Mr. Sperry agreed with Mr. Weeks on this ground, and said that false statements were often made as to rates outside. In Chicago consumers had mentioned lower rates as prevalent in New York, and on inquiry he found the statements to be false.

Mr. Ridlon suggested that it would be well to have the committee make a list of the prices charged in various parts of the country, as well for machinery bought as for lights supplied. He thought it might stop the present cutting of prices, which was so ruinous, going in some cases as far as half the actual cost of the light. Let there be uniform rates, and then let the competition come between the various machines on their intrinsic merits.

Mr. H. M. Cleveland made a warm appeal for less competition of the kind heretofore indulged in. He held that there was plenty of room for all the companies engaged in the business, and that it was not fair for a new company to crowd in where a company was already doing a good business at reasonable prices, and was giving satisfaction. As for his own company—the Schuyler—he was glad to say this was their policy, and though they were not overcrowded with business, he could say they were doing all they could look after. If there was this conservatism of the right kind, electric light stock would rank as highly as the best investments now quoted in Wall street.

The motion to put on the table was lost, and the original resolution was carried. It was also agreed that the chair should appoint the committee, to be composed of one representative from each system having active membership in the Association.

Mr. G. S. Bowen was then called upon to speak upon the subject of "The Superiority of the Electric Light over other Illuminants." He said, that this was a subject of great importance and one that should be spoken to very carefully. He would remark in starting that there had been a great waste of light in the public lighting of cities and of hotels, halls and houses. The light had been produced at great expense. But if they measured the quantity furnished, they would find that the arc lamp gave a much cheaper light as well as was far more desirable. For subdivision and for the internal lighting, of course incandescent lighting was preferable. As to the opposition now offered by the gas companies to what they considered a formidable opponent, he might mention that in a Western locality five or six of the little local gas companies had formed a syndicate, and whenever an item against electric lighting appeared anywhere, it was reprinted in the local papers at the expense of the syndicate. It would perhaps be well for the electric lighting interests to adopt similar tactics and reprint the items as to the damage caused by gas explosions, and as to the number of deaths due to "blowing the gas out."

He believed that in a very short time the cities of the Union, without exception, would be lighted by electricity. The work had already been actively prosecuted, and as to the ultimate triumph of electricity there could be no possible question.

Mr. Bowen then went on to show how the applications of electricity were improving, and he applied the argument to the perfection of the electric light. There stood, he said, at the Electrical Exhibition last year, side by side, two telegraphic instruments, one the original used by Prof. Morse to send his first inspired message, and the other the latest triumph in telegraphy, the synchronous multiplex machine, by means of which an operator could send no fewer than 72 messages over one wire. The same improvement might be expected in electric lighting. To-day in Chicago one hundred men were required to light the gas burners of the city, whereas at Elgin and Detroit the whole city is illuminated in an instant by one touch!

Mr. Bowen went on to argue eloquently that electric light was one development by the way, and that electricity would become a general motive power. "I say," he exclaimed, "give us the opportunity of attaining the highest civilization we can enjoy. Give us sound and healthy bodies; give us no more darkness; but give us light! more light! give us the electric light. It is the poor as well as the rich man's light. It will light the suburbs as well as the central portions of your city. It is, in fact, the light for all. That it is infinitely superior to any other illuminant known, there can be no question. That it is more economical than any other system in use for general illumination, has been most clearly demonstrated; and the most exacting tests show that where candle-power is considered, the electric light has no peer, either as regards its illuminating power or its actual cost. We have no quarrel with our gas friends. We want gas to cook our food, warm our houses, generate steam for our factories, besides many other uses. There is a great future for gas, but for lighting our cities, opera-houses, stores, railroads, depots, yards, churches, halls, etc.; lecture rooms, manufactories, etc., the electric light has come, and to stay."

The President: Mr. A. F. Upton, of Boston, will address the Convention on "Steam Power in Reference to Electric Lighting."

Mr. Upton: Mr. President and Gentlemen: My few remarks to-day will be more particularly directed to the construction of central stations for electric lighting for arc and incandescent. The first introduction that our company (the Jarvis Engineering Company) had in regard to electric lighting was made in the city of New York, in the first central station that was ever started in this country of the Brush system. That was followed by Mr. Morrison's company in Baltimore, by the Brush Company in Albany, and afterward by the Boston Brush Company. Since then we have completed and thoroughly equipped all but three of all the central stations in New England, and partially completed and partially equipped stations all over the United States. We have stations in California and in the Southern States—in Mobile. We have them in Canada; we have them, in fact, all over the country, and in some places outside. The principal thing to my mind in regard to electric lighting is the power, and then comes the cost of power. I have always claimed, from my own experience, that the matter of power in regard to electric lighting was figured in one sense on a wrong basis. My idea, in order to get at the bottom of all economy in electric lighting is that the cost of power should be most carefully looked to. The only thing to be got at is the actual price per lamp per hour—not evaporation, or pounds of coal per hour. It is the actual cost of running an incandescent lamp per hour. The first question that would arise in regard to that would be fuel. In selling light you are selling power. That is one thing always before your mind. In carrying out that line of argument I propose to state my own experience. Believing that electric lighting had come to stay, we devoted all our energies toward getting up the most economical plant that we possibly could. We decided to use direct-acting engines, that is, direct belting, not using long-stroke engines. That was our experience in watching several stations at the start, and in the stations that we subsequently equipped, we adopted the Armington & Sims engine. In regard to boilers, we have finally settled on using a plain steel tubular boiler. The size we are generally putting in now is 6 by 16, and 140 three-inch tubes, giving us 120 horse-power. At the Edison station we have indicated, with a boiler of that size and that engine, 150 horse-power, with 80 pounds of pressure. We have run at that station between fifteen and nineteen hundred 10 to 16 candle power lamps of the Edison system. We used cheap fuel. In a test taken with a boiler alongside of it, it showed an economy of 22 per cent. as regards using soft bituminous coal. The principal point we have made in regard to fuel was the utilization of all kinds of cheap fuel, such as screenings, soft coal, slack, cinders from locomotives, sawdust, cottonseed waste, rice shucks. Anything that has anything combustible in it, whether wet or dry, we have used to good advantage. We have taken great pains to obtain our figures. In some cases I have obtained them; in others not. There seems to be a reluctance among people to tell the figures. But the lowest I have is from the Thomson-Houston company in Lewiston, Me. They are running at a fuel cost of two mills per lamp per hour. I found that the average cost on a station we have fitted up has been, using screenings and soft coal and using arc lamps, about four mills per lamp per hour. Incandescent figures I have not been able to obtain. A test has recently been made where we partially fitted up stations on the Edison system. I have talked with a great many of the electric light people, and I have tried to enforce my ideas, that it is not evaporation, but the actual cost of the day's or night's run that is wanted. If one man gets fifty cents and another three dollars, the man that gets the fifty cents gets the best results. In fitting up stations I spoke of using direct belting engines. We found in making several tests, that the power lost in driving shafting has run from 10 to 15 per cent. There are gentlemen in this convention who have a plant in which it took 22½ per cent. of the power to run the shaft. There is a station in the city of New York where they have been shut down two weeks on account of the breaking of the shafts. That can never happen where direct belted engines are used. Another point is that in running direct belted engines, as a rule, not more than 50 arc lights are put on a circuit. Now if those are run from one dynamo, or one engine, if one engine breaks down your whole system is not disarranged. In fitting up stations I simply propose what we use ourselves. We use Sheffield grates, and the National Heater, made in New Haven. Wherever we can we use the steam damper, keeping the pressure even and keeping the draft right. I would advise all to use, where tubular boilers are used, the steel cupola. I found that where slack coal or bituminous coal is used, it helps much in keeping the tubes clean. Of course that depends very much on the engineer and fireman. I found a great deal of difference in that. In every station we have put in scales for weighing coal. All well-regulated mills with which I have any acquaintance, scale all their coal.

I do not wish to enter the question of electric lighting. That is not in my line at all, but we have done work for a considerable number of companies and I would like to speak of one system that is working now in the city of Lawrence. We have three engines in that station. We have just sold two 10 by 12 Armington & Sims engines, 70 horse-power each, to run a new system that is just in there, called the Municipal system. They run on that system four circuits of ten miles each. I am now talking of the incandescent system, these being 32 candle-power lamps. They contracted for 500 of those lamps every night for $650 per month. Now it may puzzle you, but it puzzles the gas company still more—how they are going to do it.

There is one other thing that has occurred to me several times, that I think the electric light companies should take into consideration, and that is the letting of power. At this same station a large number of motors are used, which run all day. They run from half a horse-power to five horse-power. Those motors are all employed, as I understand from the parties, at a good profit, and it has always seeemed to me that every one should use their power. You have it there, and why not use it? In one Thomson-Houston station, at Brockton, the construction of the plant is so peculiar that I think I am justified in bringing it up before the convention. It was changed so that over the station a shoe-shop has been fitted up. The shoe-shop is run by the engines in the day-time, and they receive as a rental for that power $2,000 a year. This is supplied by a 35 horse-power engine. It does not require quite 35 horse-power, because while one engine runs the machine in the shoe-shop, the other runs all the electric lights in the city. If all stations were built in that way, there is not one in the country but what would hold out a very handsome profit on the surplus power they might have in the day-time.

Another point in regard to the station—there are two stations there. There was an Edison company started first, and afterward a Thomson-Houston arc system, and this is the result: After the incandescent started, the sale of gas increased largely, and after the arc came in it increased again 10 or 15 per cent. Now the question is asked, How did the introduction of so many arc and incandescent lights increase the sale of gas? I can account for it in no other way than that when one store is lighted brilliantly by electricity, the next one has to use more gas. My experience in New England has been that every gas company has increased the sale of gas as the arc lights have been introduced.

We have had some experience in regard to electric lighting and water-power in New England. As a rule, water-power has been entirely abandoned. The trouble has been that it is not reliable. In Manchester, the water has been very low several times in the last few years. In Lewiston and Holyoke it has given out altogether, and the stations there are entirely equipped with steam-power. I understand there is a very successful station in Rochester running on water-power.

I should be pleased to answer any questions, so far as it lies in my power to do so.

Mr. Winchester said that at Holyoke, Mass., there had been seasons when the water-power there was not available; but that did not by any means kill it for electric lighting. They were running a Schuyler arc light plant of at present 103 lights, and had made it pay from the start. They hired their water-power, and practically used nothing else, and it had been fairly profitable so far. They were convinced that water-power was ahead of steam power when you could get it.

The discussion then drifted off into an examination into the supposed cost of fuel per lamp per hour, whether taken on a "test" or from the actual consumption and number of actual lamp-hours per month. The discussion was participated in by Messrs. Jepson, Upton, Sperry, De Camp, Ridlon, Duncan, Weeks, Ide, Officer, Mayo, Kerr, Morrison and others, and finally dealt with the comparative economy of direct belting of engine and dynamo and the use of lines of shafting, and with the comparative merits of high-speed and slow-speed engines. Mr. De Camp expressed his preference, based on trial and experience with a large station, for running dynamos off long lines of shafting or even countershafting, actuated by a large engine, such as the Porter-Allen. Mr. Ridlon supported this view, which was, however, warmly controverted. In summing up the discussion, the chairman (Mr. Morrison) said: "I think that the experience of Philadelphia has settled the question as between shafting and direct belting. There they had experienced all the difficulties that could arise, and had applied all the remedies which could be suggested, and as I said at the Chicago meeting, the Philadelphia case settled it in favor of the large engine with shafting. I have been asked to give the experience of our company in Baltimore, but it is only a repetition of what Mr. De Camp has reported." He said that they would rather put in a 500 or 600 h.-p. engine than two of 250 h.-p. each. Their total experience in Baltimore was against the use of independent engines for each machine, and in favor of large engines as against small ones, where there was the work for large engines to do.

The convention adjourned until 2 P. M.

The afternoon session was called to order at 2:15 P. M.

Mr. Leggett, of the Detroit Iron Tower Company, read a very interesting paper on "Tower Lighting for Cities." He advocated most strongly the adoption of that method under all circumstances, and gave it as his practical experience that towers of no greater height than from 150 to 175 feet should be used for the purpose. At this height he showed that the full effect was obtained over the greatest area, and read numerous newspaper extracts in substantiation of his claims.

He gave it as his experience, also, that the most economical number of lamps to be used on a tower was *four*, and those of 2,000 candle-power. He showed that increasing the aggregate of 8,000 c. p. thus reached to 11,000 c. p. by the addition of lamps, increased the effect of the variation very little, according the law of the intensity of light. He also pointed out the advantage that in using the ordinary 2,000 c. p. lamp no special machines are required, and that they can be run from the same circuits furnishing current to private customers. The entire area lighted by electricity in Detroit is 10⅛ square miles, and not a single gas or naphtha lamp is now used there for street purposes; although there are 382 lamps, of these 358 are on towers and 23 on poles. The latter are stated to be no real necessity, but are used for convenience or advertising purposes. These lamps displaced 3,782 gas and naphtha lamps, which covered an area two square miles less in extent than that now covered by the electric lamps, which are placed upon 90 towers, of which three are 175 ft. and the rest 150 ft. high.

Mr. Leggett summed up his remarks with the following recommendations:

1. Towers not less than 150 ft. nor more than 175 ft. high.
2. Lamps of 2,000 c. p.
3. Five or six lamps for a central tower, but not more than four for each of the others.
4. In dense business sections towers should stand about 1,000 ft. apart; for the best residence sections, 2,000 ft. apart, and for the remaining sections and suburbs, about 2,500 to 3,000 ft. apart.
5. They should be arranged as nearly as possible in triangular order, so as to shed the light from at least three towers over the most distant sections.
6. In towns of 12,000 inhabitants or less, one central tower and others arranged 2,500 ft. therefrom will accomplish an effectual lighting; and in villages of less than 5,000 inhabitants one tower with from six to eight ligh will answer every purpose and should be 175 feet high.
7. The tower should stand on a pillar and should be of uniform dimensions from base to top, and sustained by guy cables.

During the discussion which followed the reading of this paper, Mr. Leggett, in reply to a question, stated that one man was capable of attending to the trimming of the lamps on 14 towers.

With regard to the placing of reflectors above the lights, experience had shown that they were of comparatively little advantage, and that they prevented the illumination of the surrounding atmosphere, which added not a little to the general illuminating effect. On the towers in Detroit, the globes on the lamps have been replaced by flat lanterns, and any breakage is easily repaired by sliding in a fresh pane of glass, which greatly reduces the expense; indeed, Mr. Leggett stated that this item of expense had been reduced to $\frac{1}{15}$ its former amount.

Dr. Moses then took the floor and spoke at considerable length on "Incandescent Lighting." This gentleman opened his interesting address with the broad statement that arc-lighting had reached a point at which no great improvement could be expected for some time to come. He followed this up by averring that having gotten a good hold upon street lighting, the arc companies being through with the fight with the gas companies, had begun to fight among themselves. The incandescent light, in his opinion, had an enormous advantage over the arc, in that its field is unlimited. He showed by statistics that street lighting in large cities employed but 5 per cent. of the entire number of gas-burners in use, and in smaller cities only 3 per cent. The gas companies must therefore be met by the incandescent light, which will take away their principal and most profitable business. He stated it as his opinion that the cost of carbons, attendance and other necessary repairs to arc systems in a great measure reduces the comparative economy of the arc over the incandescent light, notwithstanding the fact that five times as much light can be produced by the former per horse-power.

The direction in which improvement in incandescent lamps must be looked for is in still further reducing the size of the carbon filament. Dr. Moses had made filaments as fine as spider threads from the fibres of a garden weed, but had not been able to obtain uniformity of cross-section. He advocated strongly this diminution of cross-section, and stated that when the time arrived that twenty 16 c. p. lamps could be run with one horse-power, the death of gas as an illuminant would be at hand. This time he expected to see in comparatively few years hence; and judging from what had been accomplished in the last seven years, and from the number of talented men who are working on the problem, he had no doubt of its early solution. The infant incandescent lamp would come to manhood and strangle gas with one hand and petroleum with the other.

After this address, the conclusion of which was greeted with applause, the President, Mr. Morrison, rose and stated that he took it for granted that the arc light stopped at the door of the dwelling house, and that future gains in the electric lighting business must, to a considerable extent, be looked for in the direction of the incandescent light. The remarks of Dr. Moses would, he stated, be food for thought for all present, and he himself looked forward to the fair times in store for the incandescent lamp. He denied, however, that the arc lighting companies were trying to annihilate one other, and admitted frankly that one of the objects of the convention was to prevent that very occurrence.

Mr. O. L. Jones then arose and made a few remarks on "Engines for Small Domestic Plants." He stated that he found great difficulty in procuring good engines of small power to run from 10 to 35 lights, and that several gas engines he had used had not proved successful. Mr. George S. Bowen stated that a Shipman kerosene engine at the University of Ann Arbor had given good results in running a dynamo of one arc light, and that those in charge were well satisfied.

"Incandescent Lights on Arc Light Circuits" then became the subject of discussion, and some interesting facts were brought out.

Mr, Leggett, of Detroit, said that no difficulty was experienced in that city in running both on the same circuit, including the tower arc lights, and that good success was obtained.

Mr. Holt, in speaking of the system employed by the Grand Rapids Electric Light Company, stated that experience had shown that eighty groups of incandescent could be run in the place of sixty arc lights, and that the rental therefor showed in consequence a larger profit both on that account and on account of the reduced cost for attendance.

Dr. Moses arose here and spoke on the subject of running arc lamps on incandescent circuits. The ordinary form of differential arc lamp was unsuited to that unfamiliar system which required a lamp the regulation of which, to be effective, was a direct function of the current. The lamp must respond instantaneously to every variation in its condition, and for this purpose an electro-magnet at the point of saturation was most serviceable on account of its sensitiveness.

At the conclusion of these remarks, Mr. Bowen read the invitation of Messrs. Mitchell, Vance & Co. to the mem-

bers of the convention to inspect their incandescent electric light fixtures at their works. A watch with the Giles anti-magnetic shield was also shown and passed around among the members.

The meeting then adjourned until 10 A. M. Thursday.

The last session of the convention was called to order by President Morrison on Thursday morning at 10:45.

Mr. Cleveland, of Hartford, a member of the Executive Committee, arose and read a resolution fixing the next annual meeting of the Association for February, 1886, to be held at Baltimore. This was adopted, and it was announced that steps would be taken to arrange for an exhibit of the apparatus of the associate members who deal in electric light supplies.

Mr. Ridlon offered a resolution that Baltimore be made the headquarters of the Association, and that the office there be made the repository of all information relating to the electric lighting.

This was adopted.

Mr. Callender then arose and extended an invitation to the members to inspect the Callender Works at East Newark, on Friday, the 21st.

Mr. G. H. Wadsworth moved that a committee of three be appointed to select foreign honorary members, and the President appointed Messrs. Ralph W. Pope, W. J. Johnston and George Worthington on that committee.

Mr. Sperry was then introduced and read a very interesting paper on "The Best Form of Dynamo." He pointed out the errors to be avoided and formulated the rules to be followed on good construction. He laid particular stress upon the fact that a durable and efficient dynamo must be constructed with due regard to mechanical as well as to its electrical features, and he illustrated his remarks by several figures on the blackboard.

During the discussion which followed, Mr. Spang controverted the opinion expressed by Mr. Sperry, that for the greatest efficiency the armature must be exposed to the greatest possible influence of the pole-pieces. As an illustration of this he cited the Ball "Unipolar" dynamo.

Mr. F. Spang also offered a resolution calling upon the different electric light companies to furnish various sizes of machines to the Association, for the purposes of test and comparison. This resolution was adopted. Mr. F. J. Sprague also made an able technical speech on the subject.

At this point a recess of 15 minutes was taken, and at the reassembling Mr. Ralph W. Pope read an interesting paper on "Underground Systems." He rehearsed the various attempts that had been made and gave it as his opinion that underground systems were entirely feasible, notwithstanding the objections raised against them.

Mr. George H. Benjamin followed by relating his experience in underground systems in England and on the continent of Europe, and stated that no difficulty was experienced there. As to the laying of lighting wires underground, he emphasized the caution which should be taken of keeping wires out of the field of adjoining ones, so as to prevent inductive action, which, he claimed, greatly reduced their efficiency as current carriers. He also advocated the laying of naked wires, insulated from each other, in perfectly watertight compartments, and so as to be open to inspection. Where no general underground conduit had been adopted, Mr. Benjamin recommended lead-covered cables.

Mr. E. M. Sperry, in speaking on the same subject, said that in Chicago he had found the underground system very expensive to maintain.

Mr. De Camp showed that the cost of maintaining overhead wires—not poles, however—in Philadelphia did not amount to more than $\frac{1}{10}$ cent per lamp per day, and that after five years' use the wires needed no renewal. These figures were warmly controverted as incomplete.

Mr. W. O. Callender was then introduced, and gave a very interesting history of the cables and system made by the Callender Company, stating that their extended use in England had not been accompanied by a single failure. The use of "bitite," or prepared bitumen, answered all the requirements of protection from moisture and other destroying influences, and afforded very high insulation, so that not one cent had been spent for maintenance on the cables laid in England. He exhibited plans for running main lines of arc-light wires up to 50 in number, which he claimed would answer all requirements.

The hour for adjournment (2 P. M.), having now arrived, the Chairman rose, and after thanking the members for their attention and courtesy towards him, appointed the following committees:

ELECTRICITY AS AN ILLUMINANT.—Messrs. G. S. Bowen, Otto A. Moses, E. A. Sperry and A. J. Holt.

PROPER CONSTRUCTION AND MAINTENANCE OF LINES.—Messrs. A. J. Holt, B. Dalzell, S. A. Duncan, P. Fahey and E. R. Weeks.

BEST EQUIPMENT FOR ARC LIGHT STATIONS.—Messrs. D. E. Evans and N. S. Possons.

OPERATING EXPENSES.—Messrs. E. R. Weeks, A. J. De Camp, G. D. Guernsey, O'Connor, E. H. Goff and H. C. Tudor.

BEST OVERHEAD LINE WIRE.—Mr. Callender.

CARBONS AND GLOBES.—Mr. Frank Ridlon.

STORAGE BATTERIES.—Messrs. A. J. Holt and George H. Benjamin.

MOTORS.—Messrs. C. J. Van Depoele and Wm. Hochhausen.

ARC LIGHTING.—Wm. Hochhausen.

HISTORY AND PROGRESS OF ELECTRICITY AS APPLIED TO MOTORS.—Mr. W. J. Johnston.

HISTORY AND PROGRESS OF ELECTRIC LIGHTING.—Mr. George Worthington.

ELECTRIC LIGHTING IN CANADA.—Mr. C. A. Ross, of Montreal.

BEST INSTRUMENT FOR MEASURING HIGH-TENSION CURRENTS.—Mr. C. J. Van Depoele and Profs. E. J. Houston and Elihu Thomson.

STEAM POWER.—Messrs. A. L. Ide, D. E. Evans, A. J. De Camp.

UNDERGROUND LINES.—Messrs. R. W. Pope, E. A. Sperry, Wm. Patterson.

INCANDESCENT LIGHTING.—Dr. Otto A. Moses.

COMMITTEE ON UNIFORM PRICE IN APPARATUS AND SERVICE.—Frank Ridlon, Brush-Swan system; Ch. Cooper, Thomson-Houston system; G. S. Bowen, Van Depoele system; W. A. Chase, Schuyler system; C. B. Bernoys, Sperry system; L. F. Lyne, Ball system; A. L. Ide, Fuller system; A. J. De Camp, Brush system; Th. Smith, Fort Wayne Jenney system; G. D. Guernsey, Excelsior system.

After the announcement of these committees the meeting was finally adjourned.

EXHIBITS AT THE CONVENTION.

During the convention the room constituting the headquarters of THE ELECTRICAL WORLD was visited by a large number of members, several of whom had their apparatus exhibited there. Among them was Mr. W. B. Cleveland, who showed a number of his switches and cut-outs of his design which elicited much commendation from those present on account of their simplicity. Messrs. Hine and Robertson also showed their damper regulator.

We also noted the products of the Callender Insulating and Waterproofing Company, who exhibited their system. Among the other exhibitors were the Benedict & Burnham Mfg. Co. who distributed handsome sample boxes of the Mowbray patent wires.

The Boulton Carbon Works, the Parker-Russell Mining and Manufacturing Company and the Pittsburgh Carbon Company all exhibited carbons, and the Standard Underground Cable Company, the Western Electric Company and the American Electrical Works showed the various appliances with which their names are respectively connected.

Messrs. Mitchell, Vance & Co. took quite a number of the members through their factory and show rooms, their beautiful electric light chandeliers eliciting the admiration of all.

On Friday night many of the members and other gentlemen visited the Callender Works. Of this visit we shall have more to say next week.

Reunion of Old-Time Telegraphers.

The reunion of the Society of the U. S. Military Telegraph Corps and of the Old-Time Telegraphers' Association was held in this city on Wednesday and Thursday of the present week, and proved to be one of the most enjoyable meetings of the Associations. The attendance was also larger than on any preceding occasion, and, although the objects of the gathering were chiefly social, the interest taken in the several matters brought before the meetings was very marked.

The business meeting of the military corps was called to order at 11 o'clock on Wednesday morning, in the parlor of the Murray Hill Hotel. President W. R. Plum was in the chair. Among the prominent members present were Vice-President E. Rosewater, Colonel James R. Gilmore, Colonel John C. Van Duzer, Captain L. T. Sheldon, Secretary J. E. Pettit, Comrades W. J. Dealy, M. H. Kerner, W. B. Somerville, J. H. Bunnell, D. H. Bates, Sol. Palmer, L. D. Parker, Richard and John E. O'Brien. A number of Old-Timers were also present, including Messrs. James D. Reid, S. B. Fairchild, C. S. Jones, Charles G. Eddy, Wm. D. Sargent, F. B. Knight, Walter P. Phillips, H. Y. Bresee, Geo. C. Maynard and Geo. M. Dugan. The meeting was exceedingly interesting, and the discussions were entered into with much spirit.

The U. S. M. T. Corps, in addition to its sociable features, has the object in view of securing from Congress, if possible, a recognition of the services of telegraphers during the War of the Rebellion. We have pointed out upon a number of occasions in these columns the important part which telegraphers took in the military service during the war. President Plum, in his address, presented the matter in a very clear and able light, but we regret that the crowded state of our columns and the lateness of the meeting prevent our giving anything like a detailed report of the reunion in this week's number.

After the delivering of the President's annual address, the following new members were elected: Messrs. D. Wilmot Smith, I. A. Sherman, Geo. M. Lyons, Isaac W. Hallum, C. H. Spellman, John Lonergan, D. J. Ludwig, W. H. Merkley, J. J. Wickham, H. R. Trowbridge, D. H. Fitch, E. O. Brown, J. W. Winthrup, I. D. Maize, Frank Duncan, T. D. Williams, D. H. Bates, F. H. Duncan, John W. Parsons, D. B. McCoy.

A verbal report was made by Comrade Rosewater on behalf of the Committee on Congressional Action. Comrade Rosewater also moved that a committee of three be appointed by the President to draft resolutions commemorative of the death of General Anson Stager. The President appointed as that committee: Comrades E. Rosewater, A. G. Sofford and Robert Lines. The Secretary and Treasurer's report was then read and approved.

Col. J. C. Van Duzer offered the following:

WHEREAS, One of our comrades has been severely afflicted, and is by such affliction rendered unable (although sincerely desirous) to meet with us on this occasion; therefore be it

Resolved, That this society extend to that comrade, Seymour J. Kelly, of Painesville, Ohio, its heartfelt sympathy in the affliction that has befallen him, and hopes that he may be fully restored to health; and be it

Resolved, That the secretary furnish Comrade Kelly with a copy of these resolutions.

It was moved and carried that the report of the committee on resolutions regarding Gen. Stager report at the banquet.

It was moved and carried that the present Congressional Committee be continued, and that the President be empowered to appoint two additional members.

It was also resolved that an assessment of $3 be made for the purpose of creating a fund for the relief of indigent members, and also to meet the expenses of the Congressional Committee in its work looking to a recognition of the services of telegraphers in the civil war. The President and Secretary to be an auditing committee on bills presented by the Congressional Committee, the amount of such bills not to exceed $500. The former officers were re-elected for the ensuing year.

After a little other routine business had been transacted, the meeting adjourned.

The joint banquet of the two Associations took place at the Manhattan Beach Hotel on the evening of the same day, Wednesday. Preceding the banquet the members were to have witnessed an interesting display of fireworks by Professor Pain, under the title of "The Last Days of Pompeii." Unfortunately, however, it began to rain about 6 o'clock, and this continued until nearly 8, which prevented the giving of the fireworks exhibition. At a little after 8:30 the guests sat down to the tables, which were made in the form of the letter T. There were about 150 present, including several ladies. The menu was as follows:

Little Neck Clams.
Green Turtle. Chicken Broth.
Bouchées à la Reine.
Amontillado.
Sheepshead à la Hollandaise.
Cucumbers. Potato Croquettes.
Filet de Bœuf aux Champignons.
Tomato Farcies. Egg Plant.
Pontet Canet.
Ris de Veau, aux Petits Pois.
Soft Shell Crabs.
Suprême de Volaille Périgord.
Heidsieck.
Punch à l'Americaine.
Plovers on Toast.
Lettuce Mayónnaise.
Lobster Salad.
Pudding Diplomate.
Bombes Pistaches. Assorted Cake.
Fruits. Cheese.
Coffee.

This was served in the excellent style for which the Manhattan Beach Hotel is famous, and full justice was done to it by the telegraphers. In connection with the banquet, there was a pleasant little surprise for the visiting members. Hitherto it had been customary for each member to pay his share of the expenses of the banquet. On this occasion, however, the Committee of Arrangements bore all the expense for the out-of-town members, so that each of the visiting members was presented with his banquet ticket with the compliments of his New York brethren. This created an exceedingly pleasant feeling, which was very gratifying to all connected with the reunion. The Long Island Railroad furnished free transportation for the out-of-town guests, and in addition provided a special train, which left the Beach at 11:30 and brought the party back to New York. There were but few speeches at the banquet, the principal one being a few feeling remarks by Mr. James D. Reid.

At 10:30 A. M. on Thursday occurred the business meeting of the Old-Time Telegraphers' Association. After transacting a part of the business the meeting adjourned, to reconvene on the steamer. Shortly after 1 P. M. the members of both Associations went on a trip around New York Harbor and Bay on the steamer "Sylvan Dell," as the guests of Commodore Erastus Wiman, President of the G. N. W. Telegraph Company of Canada. Mr. Wiman personally welcomed each guest, and his efforts and those of the Committee of Arrangements, toward making everybody feel "at home," were so eminently successful that the occasion will long be remembered with pleasure by the participants. Among the business transacted on the steamer was the election of Mr. James D. Reid as President, Mr. C. S. Jones as Vice-President, and Mr. W. J. Dealy as Secretary and Treasurer. An excellent lunch was served on the boat, and, after a most enjoyable sail, the party was landed a little before 6 o'clock, and the reunion was at an end.

The Joint Committee of Arrangements appointed by the Presidents of the two societies to attend to making the preparations for the reunion was made up as follows:

JESSE H. BUNNELL, Chairman.

W. J. JOHNSTON, Secretary and Treasurer.

John Van Horne, Col. James R. Gilmore, W. B. Somerville, C. C. Hine, F. W. Jones, W. J. Dealy, W. P. Phillips, M. H. Redding, John H. Emerick, E. A. Leslie, J. H. Dwight, James D. Reid, M. H. Kerner, James Merrihew, D. H. Bates, Charles G. Eddy, A. S. Brown, Richmond Smith, James Brown, John Hemmens, Dr. Fowler Bradnack.

It was said that in the East very little interest had been shown in either organization. The members of the Committee seemed determined to show the Western brethren that Eastern telegraphers did take a warm interest in the associations, and that the members who might attend the reunion would be given a right royal welcome. With one or two exceptions, every member of the Committee entered into the matter with the utmost enthusiasm. It is hardly to be wondered at, therefore, that the success of the reunion was complete. There are so many members of the Committee deserving of being singled out for special mention on account of the active part they took in the preparations for the reunion, that we really can hardly mention, any without repeating the entire list given above. When the members decided to come to this city, New York was anxious to give them a cordial welcome, and to send them back to their respective homes with nothing but pleasant recollections of the reunion of 1885.

The next reunion is to take place at Cleveland, on the third Wednesday of August, 1886.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Aug. 20, 1885.

Since the sale of the Tropical American exchanges at Barbadoes and Trinidad, W. I., large additions have been made to the lists of subscribers at each place; 75 sets of instruments for Barbadoes and 110 sets for Trinidad have been furnished, and 200 subscribers at the former and 250 subscribers at the latter place are enjoying the facilities of the "Bell" telephone system.

In Venezuela the business is constantly increasing; the receipts for the quarter ending June 30 were $1,000 in excess of the one before, and the remittances to the home office grow each month.

It is rumored that Mr. John T. Wheeler, General Superintendent of the New England Telephone and Telegraph Company, has sent in his resignation, to take effect at an early day.

Mr. W. J. Keenan, of the electrical firm of Keenan & Wilson, reports having received numerous inquiries about their battery from all parts of the country, caused by the little notice published in THE ELECTRICAL WORLD of August 1.

The Jarvis Engineering Company has closed a contract for fitting up an electric light plant in Newfoundland. The lights will be of the Thomson-Houston system. The engine is of 60 h. p. and made by the Armington & Sims Company. The boiler is made of the best English steel and is set with the Jarvis patent furnace, using the Sheffield grate bars to burn Nova Scotia coal.

The Thomson-Houston International Electric Company has just closed a contract for 90 arc lights, together with the incandescents, for St. Johns, N. F. The apparatus is to be shipped at once, and the plants will be in operation inside of 40 days. The contract calls for dynamo-machines, lamps and engines, and everything necessary to equip the plants in first-class order. This is the first installation of electric light in Newfoundland and is the result of the rapid extension of the Thomson-Houston system in the British Provinces.

The Boston Electric Company are manufacturing a "cut-out" which has been warmly indorsed by the Board of Underwriters of this city. Mr. Allen has several letters, including one from the board mentioned, which speak very kindly of the "cut-out" made by his company. Several are now in use in New England, and are giving, it is claimed, general satisfaction. The "cut-out" is so arranged as to overcome all liability to "sparking" while being operated, and it has shown the very best results when tested on circuits having as many as thirty lights.

Messrs. Seth W. Fuller & Holtzer are busily engaged getting their new battery ready for the market. It will, they say, contain all the valuable properties and merits of the Leclanché-Disque, together with certain important improvements, which will bring it favorably before the public.

Mr. Spaulding, of this city, is the promoter of a new insulated cable to overcome all troubles from induction and retardation, and to be sold at a profit, it is said, for less price per foot than any cable heretofore made. A short time ago the reported merits of this new cable came to the ears of the government authorities, and it was decided to give it a test, in view of buying in large quantity should the claims of the manufacturer be substantiated. The government instructed Mr. Spaulding to lay sixteen miles of his cable between New Bedford, Mass., and a certain point on the south shore of Massachusetts Bay. This work will probably be carried out between the 1st and 15th of September. The manufacture of the cable is being rapidly pushed, and so far the work done on it is satisfactory to all concerned. It is predicted that it will successfully come up to the requirements of the rigid test to which it will soon be put. The cable is being made in the old Atlantic Works, on Border street, East Boston.

The recent consolidation of the Brush, Weston and the Merchants' electric light companies, of this city, to which reference has been made in these columns, was fully consummated at a meeting of a committee from each of the above-named companies, last week. At this meeting the board of directors was chosen. It consists of three from each company, as follows: Brush—Isaac Fenno, Joseph Sawyer and Frederick Mason; Weston—Thomas L. Livermore, F. L. Higginson, Andrew Robeson; Merchants'—E. H. Goff, Silas Gurney, E. S. Sears. The personnel of the company was then selected as follows: Col. Thomas L. Livermore, President; Hon. Hugh O'Brien, Treasurer; S. S. Sias, Secretary.

The Edison Company for isolated lighting has just closed a contract for an extension and enlarging of a plant which has been running for two years in the factory of the Lorraine Manufacturing Company, Pawtucket, R. I. The contract calls for 150 additional incandescent lights, the previous number having been four hundred.

The Thomson-Houston Electric Light Company has just been awarded the *only* gold medal, for arc-lighting, at the International Inventions Exhibition, at London, England, August 11.

This medal of honor was given to this company after a practical and thoroughly comparative test of the respective merits of every prominent system of electric lighting in the exhibition.

Mr. Thomas Hall, electrician, 19 Bromfield street, has just added to his collection of electrical curiosities three new pieces of apparatus. One of these is a battery made and used by Benj. Franklin in his experiments with electricity. This battery is one of the first used by Franklin, and is an interesting relic. The others are very valuable also, one being the first electro-magnet made by Prof. Henry, peculiar in shape and mounting. The other is an old electrical machine made by Nairne, of London. Mr. Hall also has in his possession the model of the first electrical railway, of which he claims to be the inventor.

The Boston Electric Register Company, a corporation just formed in this city, has taken offices at No. 54 Devonshire street. The officers of the company are: President, Richard M. Johnson; Secretary and Treasurer, Geo. J. Morse; Directors, William Meehan, Thos. E. Faunce, Hobart M. Cable, Geo. J. Morse, and Rich. M. Johnson. Their new and ingenious electrical apparatus for registering fares on horse cars is now on exhibition at above address, and particulars of same may be obtained by addressing William Meehan, Esq., 95 Milk street.

The annual clam-bake of the American Electrical Works, Providence, R. I., will take place on Sept. 11.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Aug. 20, 1885.

Some time ago mention was made in this column of the steam-regulating apparatus of the Milwaukee Electric Manufacturing Company. This company has now been succeeded by the Johnson Electric Service Company, of Milwaukee, with the following officers: Wm. Plankinton, president; W. S. Johnson, vice-president and treasurer; J. M. Bean, secretary. There has also been organized the National Electric Service Company, of Chicago, with the following officers: Melvert B. Carey, of New York, president; George H. Bliss, secretary; Z. S. Holbrook, treasurer. The capital stock of the Milwaukee company is $150,000, and of the Chicago company, $50,000.

The business of the Milwaukee or parent company will be confined to simply manufacturing the apparatus and supplying it to the National Electric Service Company. The business of the Chicago company will be limited to selling and putting in the apparatus. It is the intention to push the business energetically, and those in a position to know consider the outlook very promising. George H. Bliss, formerly Manager of the Western Edison Light Company, has resigned to take the position of Secretary of the National Electric Service Company.

Edward E. Harbert & Co., manufacturers of mechanical telephones, 159 La Salle street, Chicago, have lately sent over 100 sets of their instruments to South America and Mexico.

The contract for wiring the new State House at Indianapolis for incandescent lights has been awarded to W. S. Glover & Co., of Detroit, Mich.

The Central Union Telephone Company has issued a circular to its Indiana subscribers notifying them that toll lines will be kept up and in operation during the pending telephone suits, but no money collected for service until after the decision has been reached in the test case in the Supreme Court.

The Fort Wayne Jenney Electric Light Company has just secured two nice city lighting contracts at Peoria and Pekin. The former calls for 200 lamps, and the price is $29,000 per annum. These lights are to be in operation by November 1. The power used will be five 12 × 16 double-disc Ball engines. At Pekin 35 lights are to be in operation by November, and the contract price is $5,000 per year.

The Nebraska Telephone Company paid its regular quarterly cash dividend of two per cent. July 31. It also pays an extra dividend of $4.80 per share.

THE TELEGRAPH.

Commutation Books.—The Baltimore & Ohio Telegraph Company is now issuing commutation books of telegraph stamps. The stamps are in denominations of 1. 5, 10 and 25 cents and are bound in two books containing $11.10 and $11.22 respectively. These books are sold at $10 each. and a telegram with sufficient of these stamps affixed to cover the tolls thereon will be accepted at any office of the company for transmission in the same manner and under the same conditions as if cash were paid. Books containing stamps of other denominations and amounts will be issued if there is a demand for them.

Electric Time.—That Attleboro has long needed some other industry than that of the manufacturing of jewelry, is an undisputed fact, says the Providence *Telegram* of August 20, and various schemes have been set on foot, from time to time, to secure such a result, but without success. It now seems probable that the desired addition will be attained, as a party of gentlemen, representing a large amount of Attleboro capital, have been in New York the past week investigating the merits and prospects of the National Electric Time Co., of New York, which contemplates the erection of a factory here for the prosecution of their business. The company have control of the manufacture of electric clocks, now in such general favor, and the business is an immense one, demanding large factory facilities and employing a very large number of work people. Should the report of Messrs. C. L. Watson, J. L. Sweet and Peter Nerney, who constituted the committee sent to New York, be favorable, the erection of a factory will be commenced at an early date. Stock in the enterprise has been taken freely, subject to demonstration of its feasibility.

THE TELEPHONE.

Erie Quotations.—Erie continues firm. About Aug. 1 the stock took an upward start from 22, going as high as 28½ and falling back to 25⅞, recovering again to 26½ bid and 27 asked. Different parties, holding in the aggregate some 1,500 shares, supplied the market at prices running from 26 to 28, and are now hoping to buy in again at a lower figure. The course of the market indicates that they will be unable to recover so as to make a profit. Continued improvement in the company's affairs accounts for the firmness of its stock.

A Brilliant Idea.—To deter boys from climbing the telephone poles at Fond du Lac the plan of attaching wire to the spikes and connecting them with a battery was conceived, and it worked to perfection. The first day no less than 200 boys attempted to climb the pole, but immediately received such a shock that they retreated in dismay. Later, however, a farmer drove up to the pole and hitched his horses. One of the animals unsuspectingly caught hold of the spike, and immediately there was a start and a jump and the hitching-strap snapped and away went the team. The farmer suffered the fracture of three ribs in attempting to stop the runaways, one or more women were run over and the wagon smashed to atoms.—*Milwaukee Sentinel.*

New England's Prospects.—The management of the New England Telephone Company, says the Boston *Herald*, is practically committed to the payment of a dividend on the stock in October, and 1 per cent. has been estimated as the lowest probable division. At the same time it is not known that any fixed per cent. has been informally even agreed upon. In the first five months of 1885 the company has earned, as show the figures, nearly 4 per cent. upon the capital participating in dividends in October next, and should earn as much more by October 1. At the same time, it should be remembered that the company had a floating debt to be provided for. Whether it has been actually canceled is not known. The accounts show quick assets sufficient to meet it May 31, if not earlier, so that the chances are that the company will have available funds to pay 1 per cent. in October. It should show net earnings above construction for the year of some $200,000, which is 2½ per cent. If business improves and construction is kept low, the company may eke out 3 per cent. in 1886.

THE ELECTRIC LIGHT.

Bloomington, Ill.—A new electric light company, with $35,000 capital, has been organized to operate at Bloomington, Ill., under the Thomson-Houston system. It has a contract with the city for 100 arc lights for three years, and intends to give its plant a capacity for 200 or 300 lights. The contract goes into effect November 1 next, and the work of wiring begins at once. It is said that the new company starts out with every prospect of success.

A Pushing Electrician.—Mr. E. P. Roberts, M.E., General Manager of the Brush-Swan Company at Cheyenne, Wyoming, has achieved considerable reputation for his success with the large secondary battery plant used in lighting that place. He is now reported to be introducing several novelties there in the shape of motors, fans, small electric-light jewelry, and the like, and to have some important projects in electrical application well advanced.

To Light New Orleans.—A dispatch of August 12 from New Orleans says: The City Council last night voted to accept the bid of the Louisiana Electric Light and Power Company for 528 pole lights at $115 per pole per annum, for lighting the suburban districts of the city, and the Mayor was authorized to make a contract for two years. This is recorded as the cheapest bid proposed. New Orleans is probably the first city of its size on the continent to adopt electric lighting for all purposes.

MISCELLANEOUS NOTES.

Brooklyn Underground Wires.—There are 5,508 poles, 3,856 1-5 miles of wire and 6.21 miles of cable in Brooklyn. The Electrical Subway Commissioners are daily occupied in the examination of plans submitted for placing the wires underground. They are considering a system by which the wires on certain streets shall be put underground and kept entirely out of sight. The wires will be introduced into buildings under the sidewalks. Another plan under consideration is to bring up the wires at certain intervals and string them along on poles from which they will connect with subscribers' stations. The poles would be placed a long distance apart, so that the number would be greatly reduced. In districts which are sparsely settled it appears to be the sense of the commission not to put the wires under the surface.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations at the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 63¼, a 64¼; B. & M., b 2; Western Union, b 70¼, a 70¾.

Telephone.—Am. Bell, b 205, a 206; Erie, b 26½, a 27, New England, b 32½, a 33; Mexican, b 1¼.

Electric Light.—No new quotations.

BUSINESS NOTICES.

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches that are already affected.

A Useful Card.—Messrs. Holmes, Booth & Haydens have issued in very handsome folder shape, for the pocket, a table of dimensions and resistances of pure copper wire, compiled by the bright and rising young electrician, Mr. George B. Prescott, Jr. This is a highly useful card, and the firm have conferred a service on the profession by publishing it in so handy a form.

The Shultz Belting Company whose products we described in one of our late issues, is located at the corner of Barton and Bismarck streets, St. Louis, 146 feet on the former and 196 on the latter street. The bark building, which is separate, measures 55x132 feet, and a third building on Seventh street is 86x120. The company employ nearly one hundred men, and their belt for electric lighting is well known for its good qualities.

The Electro-Mechanical Gong Striker, of Fuller & Holtzer, of 22 Milk street, Boston, Mass, is most simple, effective and reliable. It has a minimum number of parts, and has a double lever escapement which allows it to work with little battery power. These gongs have been largely used in fire-engine houses, depots, grain elevators, factories and public buildings, wherever reliable signals are required. They are made to work by weight or spring, as desired.

The Printing of Steel Engravings on Celluloid is a new industry which appears to have a promising future. Marshall's engraving of General Grant, recently finished, has been reproduced by this process, and is a handsome work of art. The picture is said to be the best portrait of Grant in existence, and the manner in which it is brought out by the celluloid process is even superior to printing on India paper. Mr. George Wm. Curtis says of the picture, "It is by far the best likeness of him (Grant) as he appeared in these latter days, that I have seen, and it is very fortunate that so admirable a portrait has been obtained." D. Huntington, President National Academy of Design, says: "The celluloid print represents the engraving remarkably well, retaining the extraordinary refinement and power of the original work." Mr. M. B. Brady, the well-known historical photographer of Washington, says: "In spirit, air, drawing and tone, it is admirable—better than I have ever seen." Additional information regarding the picture will be found in the advertising columns of to-day's issue—page VII.

Hale's Honey,

The great cough, throat and lung cure, 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals—beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED AUGUST 11, 1885.

Galvanic Battery; Horatio J. Brewer, New York, N. Y..(1) 323,902, (2) 323,903, (3) 323,904, (4) 323,905

(1) Comprises an electro-negative element, consisting of two parts of different materials; one part being of a rod of comparatively good conducting material and the other of wings or projections of a comparatively good depolarizing material.

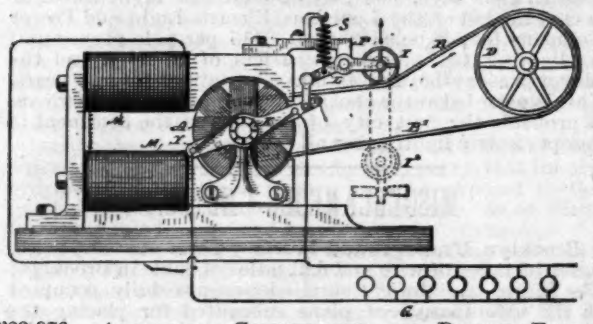
(2) The carbon element consists of a series of hollow conical bodies placed one upon the other to form a single element, the joints being shown at *C*.

(3) The electro-negative element consists in the combination of a hollow carbon having a slightly conical exterior surface with the electro-negative discs having corresponding internal apertures fitted thereto.

(4) One element consists of a central conical conducting-rod with surrounding discs, substantially flat and circular, composed in whole or in part of carbon.

Locking and Unlocking Mechanism for Electric Lock; Charles H. Crockett and Chancellor C. Allen, Boston, Mass..... 323,918

Consists in an electric lock in which the spindle with



323,976. AUTOMATIC COMMUTATOR FOR DYNAMO-ELECTRIC MACHINE.

which the outside knob is connected is normally free to rotate without moving the operative parts of the lock with which the said spindle is adapted to be connected at the desired times by means of mechanism brought into action by an electro-magnet energized by the closure of an electric circuit by the person having control of the lock from the inside of the building, by which construction the possibility of undue strain being put upon the lock through the spindle in turning or attempting to turn the same, is avoided, and the mechanism operated by the electro-magnet rendered certain in its action and free to operate under all conditions.

Electric Conductor; Russell A. Dennison, Providence, R. I..... 323,920

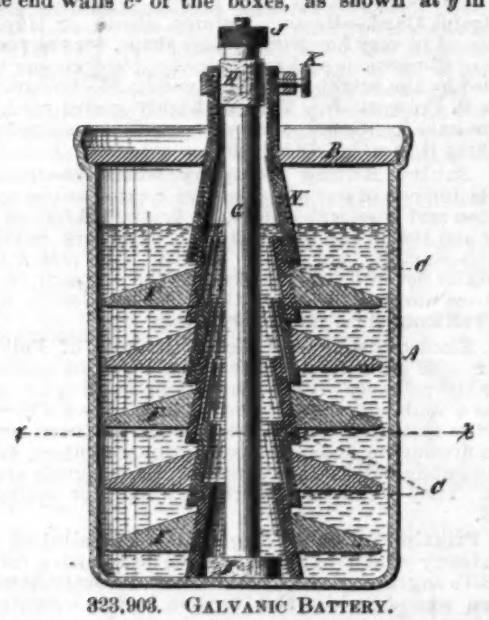
Consists, first, in the employment of a non-conducting shield or layer composed of sheet or powdered mica combined with asbestus or other equivalent material.

Annunciator; Charles E. Dey, Denver, Colo..... 323,921

Consists of a stationary metal pointer attached to the dial-plate with numbers painted on the dial-plate just below the end of the pointer, and a movable metal cover covering the pointer and number, which can be turned to one side and operated by an electro-magnetic arrangement behind the dial-plate, making an indicator.

Underground Conduit for Electrical Conductors; William B. Rogers, Philadelphia, Pa..... 323,964

The sleeves *D* are so arranged that they can be moved transversely or rotated on the pipes *a*, and may be held in place by frictional contact, as illustrated, or by means of sleeves formed on the pipes, as indicated at *x*, or by extending the ends of the sleeves to meet the inner surfaces of the end walls c^3 of the boxes, as shown at *y* in said



323,903. GALVANIC BATTERY.

last-named figure. The sleeves *D* are also provided with one or more openings *d'*, for the passage of and support for the tapped or branched conductors.

Electric Primer; Richard H. S. Thompson, New York, N. Y..... 233,974

Comprises an electrical igniter, consisting of a body of non-conducting material, having electric conductors embedded therein, and having a recess in its forward end containing the explosive or fulminate, the whole being adapted to fit the priming recess of an ordinary cartridge.

1. **Dynamo-Electric Machine**..... 323,975
2. **Automatic Commutator for Same**; Elihu Thomson, Lynn, Mass..... 323,976

1. Consists of an armature having a series of magnets supported in a suitable frame and revolved bodily around the axis of said frame, each of said magnets having a core composed of a number of H-shaped pieces of iron mounted so that the edges of their legs shall form the poles of the magnets.

2. Consists in automatically shifting the brushes, to follow the shifting neutral line, through the agency of a load or strain detector applied to the driving-power of the machine in such way that the increase of load put upon the driving-power by increase in the current delivered from the armature shall be felt, and shall cause an automatic adjustment of the commutator brushes or commutator-cylinder in the proper direction to avoid spark.

The yoke *Y* is connected by a link with the lever *L*, carrying an idler-pulley *I*, that bears upon the belt *B*, and serves to move the yoke and brushes in obedience to varying strains put upon the belt through variations in the load. The spring *S*, applied to the lever, causes the pulley to bear upon the belt, so that the varying tension of the belt may move the lever.

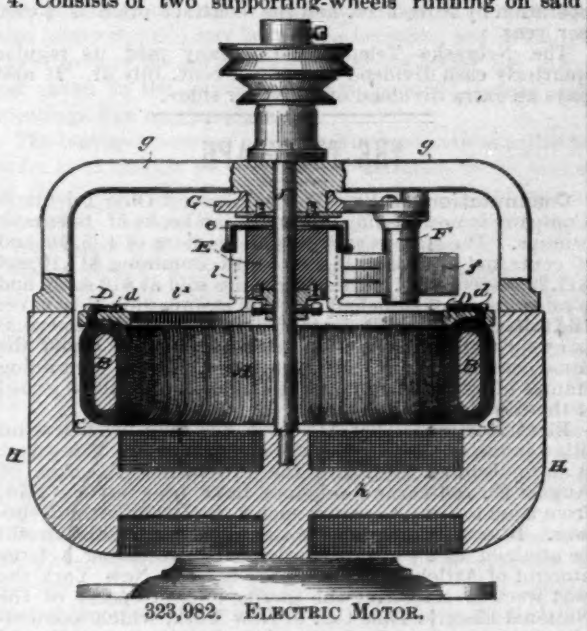
1. **Regulator for Incandescent Electric Lighting Circuits**..... 323,981
2. **Electric Motor**..... 323,982
3. **Incandescent Electric Lamp**..... 323,983
4. **Suspended Electrical Conveyor**..... 323,984
5. **Process of Making Incandescents**; Charles T. Van Depoele, Chicago, Ill..... 324,193

1. Consists of a solenoid in multiple arc from the lamps and suitable intervening mechanism controlled and operated by said solenoid, and adapted to divert more or less current through a fluid or liquid by-pass in case of danger to the lamps.

2. The longer arms *l'* radiate from the commutator like spokes, and when the extremity of each is soldered to one of the loops *d*, which extend upward from the armature-coils, the electrical connections are completed, and a strong, neat and durably-constructed armature is produced, which is fastened to its driving-shaft by simply securing the hub *E* thereto in any well-known manner. The brushes *f* are adjustably mounted in posts *F*, which are secured to a movable yoke *G*, which is attached to the non-magnetic frame-piece *g* of the machine.

3. Loose cotton, silk, hemp, Manilla, or other fibers are assembled or arranged in proximity to each other in the form of an open, untwisted band or tress having its fibers so interlaced with each other as an ordinary process of combing would leave them, these bands, tresses, or skeins being of greater or less thickness, width and length, but in all cases the individual fibers are only in loose contact with each other. Said band replaces the ordinary filament.

4. Consists of two supporting-wheels running on said



323,982. ELECTRIC MOTOR.

conductors, one of said wheels being in electrical connection with one pole of the motor and the other wheel with the other pole of the same, and each supporting-wheel having an axle running in a bearing arranged above the conductors, and connected to and supporting a car below the same.

5. Consists of, first, preparing vegetable fiber with a coating of lamp-black and varnish; second, attaching said fiber to the conducting platinum wires by means of a vegetable collar which embraces the adjacent ends of the fiber and the wires, and filling said collar with a compound of lamp-black and varnish, and, third, uniting the platina wires to the fiber by subjecting said wires, fiber, and collar to a heat sufficient to carbonize vegetable tissue.

Electric Lamp; Joseph E. Lord Clark and William J. K. Clark, Briton, County of Surrey, and Robert D. Bowman, of Leytonstone, County of Essex, England..... 324,008

Consists of a new and numerous disposition of old elements of a complicated nature.

1. **Portable Electric Gas-Lighting Apparatus**; 2. **Electric Spark Producing Apparatus**; C. L. Clarke, Manchester, Eng..324,009 and 324,010

Consists of an inductive generator of electricity, a motor mechanism to revolve the moving parts thereof, an actuating push-button for the said motor, and disconnecting gear adapted to release the said motor from the control of the push-button after a single impulse, whereby a protracted operation of the generator may be developed from a single motive impulse, together with igniting points or electrodes connected by means of suitable conductors with the said generator, whereby sparks may be produced in a continuous stream and be directed to any desired point. The machine is based partly upon Varley's electrostatic machine and partly upon the mousemill of Sir William Thomson. It consists of a hollow cylinder of non-conducting material—such as vulcanite—mounted delicately upon pivots or journals within a similar cylinder, and adapted by proper mechanism to rotate rapidly therein.

Electrical Alarm for Window Screens; Henry Garrett, Dallas, Texas..... 324,019

Consists of multiple terminals adapted to complete the circuit upon opening a window, and also embraces shunt wires, the cutting of which throws sufficient current through the bell to strike the alarm.

1. **Incandescent Electric Lamp**..... 324,038
2. **Method of Manufacturing Incandescent Electric Lamps**; Otto A. Moses, New York, N. Y..... 324,334

1. Consists of a transparent chamber having its neck formed of two sections of homogeneous glass cut apart and welded together with the metallic conductors leading through the joint thus formed, and a seal at or near the upper end of the neck consisting of a platinum stopper around which the glass of the neck is closed.

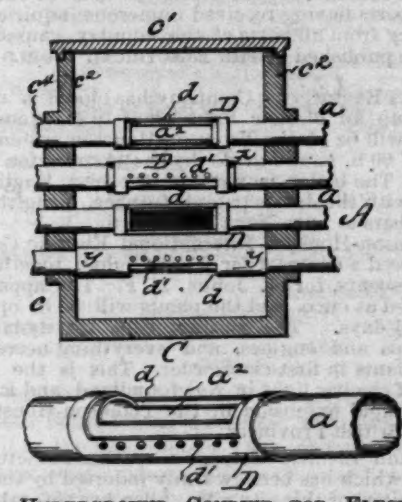
2. Embraces the method of sealing the vacuum chamber of an incandescent lamp, which consists in inserting a metal stopper into the neck of said chamber, and softening or compressing the glass of the neck around said stopper.

Electric Gas-Lighting Apparatus; Le Roy S. White, Waterbury, Conn., Assignor to the Electric Appliance Co., of same place..... 324,058

The core of a solenoid is made a valve, while the solenoid is used partially as a gas-pipe.

1. **Vibrating Electric Motor**; 2. **Electrical Synchronous Movement**; Albert S. Parcelle, Boston, Mass.....324,152 and 324,153

1. The vibrator-magnets have their poles arranged opposite the end of said vibrator outside the curve of vibration, and in a plane transverse to its longitudinal axis.



323,964. UNDERGROUND CONDUIT FOR ELECTRIC CONDUCTORS.

2. Consists of a detent in the path of the rotating apparatus at each station, electro-magnets for removing said detents from the paths of said rotating apparatus, and a key and battery at each station for transmitting an impulse of electricity to the distant station for removing the detent from the path of the rotating apparatus.

Metal-Tipped Electric Cord; William H. Sawyer, Providence, R. I..... 324,171

Consists of a flexible electric conductor having a non-conducting covering, and a metallic stem or needle projecting endwise beyond the same, the covering being surrounded immediately adjacent to the stem or needle by a metallic shell secured to the said covering by a non-metallic cement.

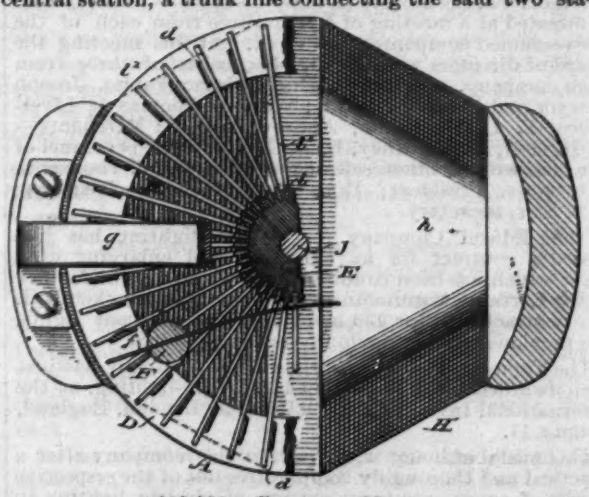
Electric Railway; Ernst W. Siemens, Berlin, Germany..... 324,176

A rail is placed at the side of the track and in conductive communication with the stationary dynamo-electric machine, and the current is conveyed from it by means of springs made of steel and rigidly attached to steel bars placed at each side of the car and projecting from the side thereof.

Consists also of a series of resistances, a switch and a rocking frame actuating the contact-brushes of the commutator to the electro-dynamic motor on the car, arranged and operating, for introducing resistances into or eliminating them from the electrical circuit according as the motion of the car requires to be stopped, started, or reversed.

Telephone Exchange System; Theodore N. Vail, Boston, Mass..... 324,192

Consists of a main central station, a subsidiary or branch central station, a trunk line connecting the said two sta-



323,982. ELECTRIC MOTOR.

tions, a series of sub-station lines converging to said branch central station, a selecting mechanism comprising a rotatable arm or lever, located at the branch central station and controlled by an electro-magnet in the trunk line from the main central station, whereby any of the sub-station lines may be selected and united to the trunk line or connected with any other converging sub-station line, and means, substantially as indicated, whereby any of the said sub-station lines may unite itself to the trunk line, disconnecting simultaneously the branch exchange ground terminals of both of the said lines.

Support for Electric Cables; Edwin H. Carhart, Providence, R. I., Assignor of half to Edwin Holmes, Brooklyn, N. Y..... 324,225

Consists in a clip for supporting a cable from a suspending wire or bunch of wires made of sheet metal, and consisting of two separate approximately circular resilient portions having hooks or catches, whereby they may be secured together after having been placed about the cable and supporting wire.

Copies of any of the Patents mentioned in this Record, can be obtained, with full specifications and drawings, from this office on application; price twenty-five cents each.